AMERICAN GAS JOURNAL

JANUARY, 1943

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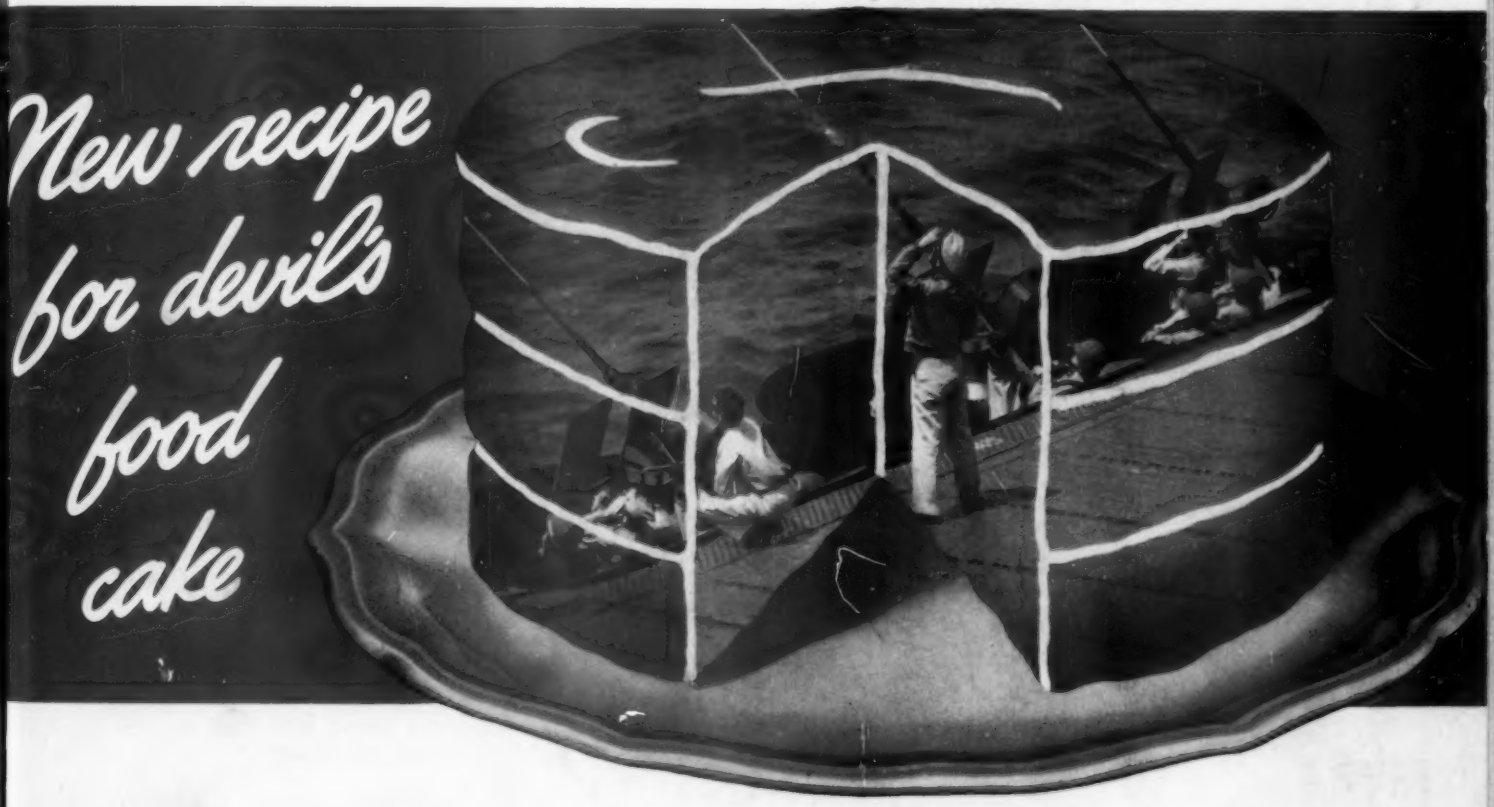

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ROBERTSHAW

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JAN 19 1943

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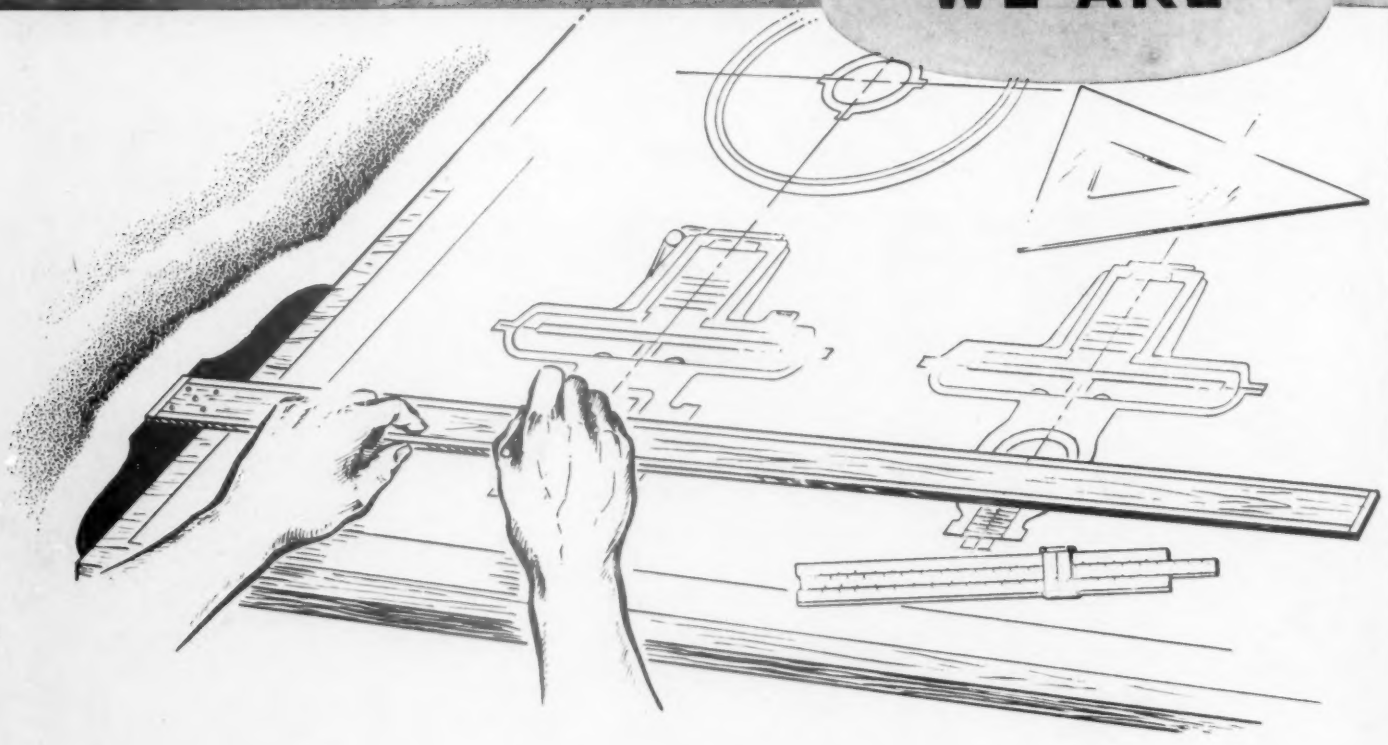

THE wonders of tomorrow will come from the germ of today's genius. Under the feverish pressure of war, developments are taking place that, in less strenuous times, might have required years to realize. Already, technically speaking, our pre-Munich world is an antiquity. The Gas World of tomorrow, too, will benefit from the effects of this precedent shattering impulse.

The Engineering, Research and Development Departments of the Pittsburgh Equitable Meter Company and Merco Nordstrom Valve Company are thinking ahead of the times. On the drawing boards new designs are taking form. In the laboratories experimental models are being put through their paces. With the Victory and a return to normal times, the results of today's research will be apparent in tomorrow's EMCO Gas Meters, EMCO Regulators and Nordstrom Lubricated Plug Valves.

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A. Yes, indeed, if it is a Semet-Solvay REVERSE FLOW Water Gas Machine.

Q. *Does operation on 100% bituminous and 100% heavy oil cause the machine to smoke?*

A. No, indeed, not the Semet-Solvay REVERSE FLOW Water Gas Machine.

Q. *Can a carbureted water gas machine be changed at will, and without alterations in the machine, from coke or anthracite to bituminous coal, and from one grade of oil to another grade?*

A. Yes, indeed, if it is a Semet-Solvay REVERSE FLOW Water Gas Machine. You can take advantage of every change in market prices.

Q. *Is the REVERSE FLOW process new and untried?*

A. No, indeed. The first Semet-Solvay REVERSE FLOW Water Gas Machine was installed in 1937. Today there are ten plants in successful operation and three more under construction. Names gladly furnished on request.

Q. *Can existing water gas machines be modernized to obtain REVERSE FLOW advantages?*

A. Yes, indeed. Semet-Solvay can apply the REVERSE FLOW principle to all three-shell water gas machines.

Q. *Are all Semet-Solvay Water Gas Machines REVERSE FLOW?*

A. No, indeed. Semet-Solvay can furnish all types of water gas machines.

Q. *Are all REVERSE FLOW Water Gas Machines Semet-Solvay Machines?*

A. Yes, indeed. REVERSE FLOW is an exclusive Semet-Solvay development.

Q. *Is it difficult to make sure just what economies and other advantages you can expect from the REVERSE FLOW process in YOUR plant?*

A. No, indeed. Semet-Solvay will be glad to make a survey and complete report without cost or obligation to you. Why not write them today?

SEMET-SOLVAY ENGINEERING CORPORATION

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A report to our Customers including Uncle Sam

THIS is January—the first month of the second year since Pearl Harbor. We—the members of the Cast Iron Pipe Research Association—makers of pipe for water, gas and sewer mains—are still in the position of having thousands of customers but *only one* to whom we can *guarantee* delivery under wartime restrictions.

That No. 1 Customer is Uncle Sam. And in spite of increased capacities, our facilities have been strained to the last ladle to furnish cast iron pipe for *Army and Navy training camps; airfields; naval bases; ordnance arsenals; tank and airplane plants and shipyards, and their housing requirements, as well as essential civilian projects.*

Also, we are making or machining in our foundries and machine shops — *guns; shells;*

tank and plane parts; machine tool castings; liners for Diesel Marine engines; propeller shafts and other ship castings; chemical and other castings; presses for making armor plate, shells, and for dehydrating gunpowder.

To thousands of our customers, whose requirements for needed extensions of water, gas

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For this *improved cast iron pipe* which we are delivering today to our No. 1 Customer—which few of our regular customers have had an opportunity to lay—we began to prepare ten years before Pearl Harbor. Two years ago, our co-operative study with leading consulting engineers representing pipe users, under the auspices of the American Standards Association, came to fruition in the adoption of the *A. S. A. Law of Design* for cast iron pipe in underground service.

We are now making cast iron pipe according to this new *Law of Design*—the most modern of all pressure pipe for water, gas and sewer mains—with all the inherent virtues of the cast iron pipe you have previously laid. This is pipe worth waiting for if your requirements for *permanent installations,* can possibly be deferred. We repeat—pipe worth waiting for. Cast Iron Pipe Research Association, Thomas F. Wolfe, Engineer, Peoples Gas Building, Chicago.

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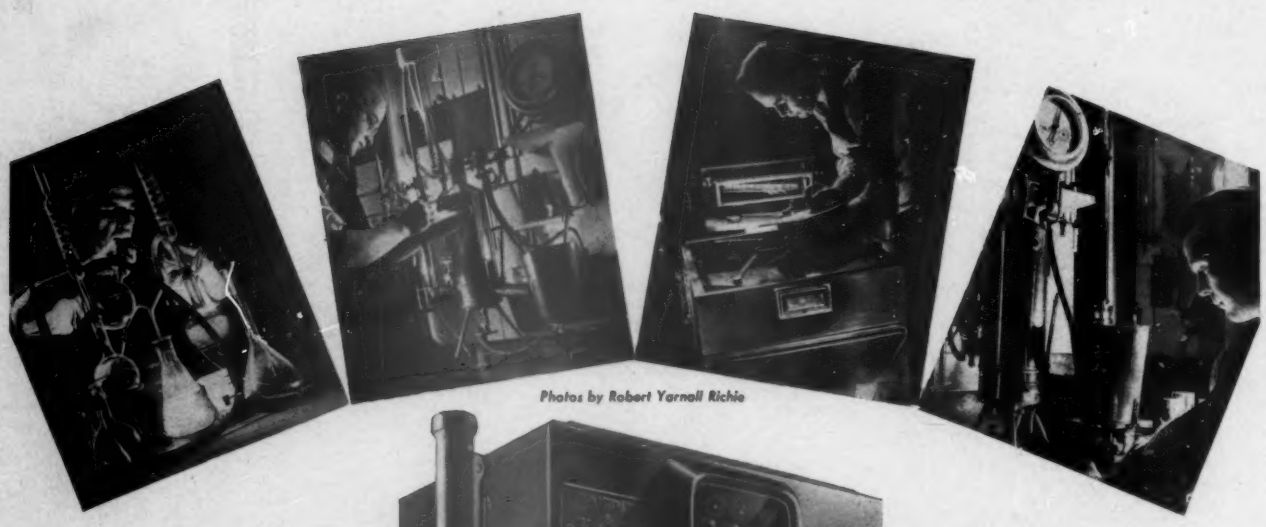

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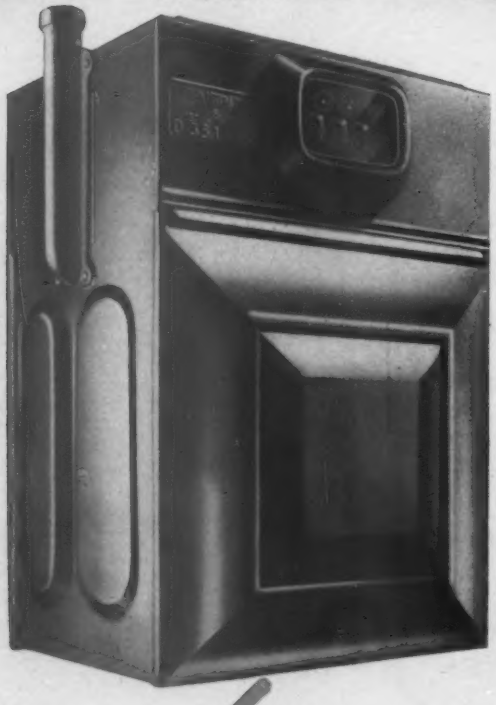

...born of research

All operations under rigid laboratory control! But the phrase, despite its significance, only vaguely hints of the intensive, unremitting labors of collective research, analytic and plant-control laboratories... of collaborating gas company meter shops and field engineers conducting trials and tests . . . of technicians fitting the results of approved "pilot" tests into production routine ▷ And all to the end that American Meter Company products, including Tinned Steelcase Meters, shall maintain their reputation for steady progress in increased values! Practical and better meters . . . more accurate, more trouble-free. Greater and greater return upon your meter-dollar investment. ▷ The details are found in CATALOG TG-4. If your copy has been borrowed, we shall promptly forward another.

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JANUARY
1943

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VOLUME 158
NO. 1

Liquefaction, Storage and Regasification Of Natural Gas For Peak Loads

By
W. E. Steinwedell

IN THE EARLY DAYS of natural gas production the consumption was either close to the source of supply or only a short distance away and when the added winter househeating load became too great for the transmission line, another line was economically installed.

As longer transmission lines and compressor stations to pump the gas became necessary, however, the question of meeting larger peak loads involved greater and greater investments in pipe lines and compression equipment and the load factor on the transmission lines became lower in spite of the greater amount of industrial and commercial gas sold.

If a cold spell, requiring a maximum of househeating, lasted for three or four consecutive days, the gas stored under pressure in an inadequate transmission system, which was the only storage available at that time, would become exhausted and the lesser important industrial consumption would have to be curtailed, unless additional expensive transmission and compression equipment, which would only be used a few days in the year, was provided.

The manufactured gas industry, in which the loads are smaller than in the natural gas industry, provided for meeting the excess consumption over manufacturing capacity by drawing on reserve supplies from either low or high pressure gas holders properly located in the distribution system.

Natural gas companies' experience in solving peak load demand problems, when the consuming community is a great distance from the source of natural gas supply and large peaks prevail, has, however, been more difficult.

Cooling Tower and three Liquid Natural Gas Storage Spheres.

The cost of standard low or high pressure gas holders for natural gas is prohibitive, as the large amount of natural gas used for househeating, which is dependent upon the weather, is extremely variable.

Some natural gas companies, having depleted fields which are gas tight, have successfully stored gas underground by pumping large quantities of gas into these depleted fields during the summer months, when the pipe line system has excess capacity, and withdrawing the gas in the winter as needed.

As field storage, however, soon exceeds pipe line pressure a compressor station is required and the surrounding gas leases must be properly controlled. This system involves less investment if the gas stored is produced from owned wells and not purchased from others, which involves paying in advance for the gas so stored, but the rate of delivery from repressured fields may not be as great as from a liquid gas plant.

Where cities have changed from manufactured to natural gas and have *old* oil or carburetted water gas plants extant, a high heating value reformed oil gas has been successfully and economically produced for supplying peak load or emergency

gas and improving the load factor of the transmission lines. This gas has been found to function satisfactorily in all types of gas burners, and serves well until the natural gas load becomes so great that the old oil and water gas plants become too small to be sufficiently effective. A new twin generator reformed oil gas process applicable to old water gas sets and of large capacity has just been perfected.

It is impractical to install a *new* reformed oil gas plant for peak load control, as the fixed charges entailed by its few days use during the year render this method prohibitive.

From the foregoing it is apparent that an adequate natural gas storage *not* requiring high pressures and large holders is necessary at the end of long transmission lines where large peaks prevail.

The liquefaction of natural gas and storing it at low temperature in *thermos* containers, made of special nickel steel internal containers and properly insulated and with an exterior steel shell, satisfies these requirements, as the stored liquid can be easily regasified at high rates by pumping it through a heater, where it is indirectly heated with steam, and then passing the gas into the distributing system. One cubic foot of the liquid when so heated produces about 600 cubic feet of natural gas, which has the same analysis as the gas which was liquefied.

After considerable laboratory and research work, a pilot plant was erected in 1939 and successfully operated for several months. The liquid gas was stored in a tank holding about sixteen hundred cubic feet of liquid gas, equal after heating to about one million cubic feet of natural gas ready for distribution and use.

Cleveland, Ohio Plant

The first practical application of this method of supplying peak load natural gas was made in Cleveland, Ohio, where the City is principally supplied with natural gas from West Virginia. The cold waves which prevailed in the East in recent winters made it difficult for all gas companies in this part of the country to maintain an ample supply, and it was felt that Cleveland should either install a new transmission line, or install a liquid natural gas plant for less than half the investment, and which would, in addition to taking care of hourly shortages, provide a large amount of gas at the end of the transmission system where it was most needed.

The plant constructed was originally designed to liquefy 3,500,000 cubic feet of gas per 24 hours, and have *three* storage tanks, each holding about 84,000 cubic feet of liquid, equal to 50,000,000 cubic feet of gas.

The total original storage in Cleveland was therefore equal to 150,000,000 cubic feet of gas, but this storage is now being increased by the installation of a new design of liquid storage tank equal to 100,000,000 additional cubic feet of natural gas. The regasification equipment has a maximum hourly capacity of 3,000,000 cubic feet.

Process

The gas to be liquefied enters the plant from the City high pressure lines at 30 lbs. per sq. in. gauge pressure and is compressed by a 600 h.p. gas engine to 600 lbs. per sq. in. gauge pressure.

The compressor cylinder oil is then removed by means of activated alumina, the carbon dioxide removed by scrubbing with monoethanolamine and diethylene-glycol, and the last traces of moisture removed by an activated alumina equipment with provision for continuous operation.

The gas is now cooled at 600 lbs. per sq. in. pressure by means of an ethylene condenser equipment in which the gas passes through, and the boiling ethylene on the outside of the tubes, thereby chilling the gas to minus 126° F., which reduces it at 600 pounds per sq. in. pressure to a liquid. This liquid passes into a horizontal surge tank, kept half full by a suitable overflow arrangement. Any nitrogen, oxygen or other gases not liquefied at the pressure and temperature are bled to the engine fuel line, or to some other suitable point.

After further chilling of the liquid in two flash gas heat exchangers to minus 139° F., it passes through a first expansion valve, governed by the overflow arrangement in the surge tank, and passes into a vertical primary liquid tank at a reduced pressure of 55 lbs. per sq. in. gauge and the temperature drops to minus 218° F. Here part of the liquid turns back into gas and goes back through heat exchangers to cool liquid gas, ethylene and ammonia, to be recompressed by an 800 h.p. engine to 600 lbs. per sq. in. gauge, have the entrained cylinder oil removed and be reprocessed into a liquid.

The liquid from the primary liquid tank passes through a second expansion valve, operated by a float in the primary liquid tank, and into the main storage tanks at a further reduced pressure, of 5 lbs. per sq. in. gauge, and the temperature drops to about minus 250° F. A small amount of the liquid turns back into gas and goes back through similar heat exchangers for compression by means of a 150 h.p. compressor and the above mentioned 800 h.p. compressor, and the cylinder oil extracted, and the gas is then reliquefied.

When the liquefaction plant is standing by but the stored liquid ready for use the small amount of gas vaporized in the storage spheres passes through an air heater, a back pressure valve set at 5 lbs. per sq. in., and a gas meter into the low pressure distribution system.

Refrigeration Equipment

The ethylene used for cooling the gas is contained in a closed circuit, where it is compressed from about 3 lbs. per sq. in. gauge and 30° F., using 1200 h.p. compressors, up to 335 lbs. per sq. in. gauge and 60° F. It is then freed of its entrained cylinder oil, reduced by an ammonia condenser to minus 8° F., and passes as a liquid into a liquid tank.

The liquid then passes through two flash gas heat exchangers and the temperature is reduced to minus 48° F.

This liquid ethylene is then cracked through an expansion valve to 5 lbs. per sq. in. gauge pressure and the temperature drops to minus 145° F., at which it liquefies the 600 lb. pressure natural gas.

When the liquefaction plant is shut down the excess ethylene is stored under pressure in vertical tanks.

The ammonia used for cooling the ethylene is also contained in a closed circuit and is compressed from about 3½ lbs. per sq. in. gauge and 30° F., by a 500 h.p. engine, to 114 lbs. gauge. It is then reduced by a water condenser to 70° F., and passes as a liquid into a liquid tank. The liquid passes through two flash gas heat exchangers and the temperature falls to 19° F.

This liquid ammonia is then cracked through an expansion valve to 4 lbs. pressure and the temperature drops to minus 20° F., at which it liquefies the 335 lb. ethylene. Ammonia gas storage during shut-down periods is not required.

Where sufficient cooling water for the intercoolers, aftercoolers and condensers is not available, a water cooling tower and circulating pumps are employed. All other compressor station auxiliaries are of the standard type.

Storage

The three original liquid storage tanks are made of concentric spheres separated by three feet of cork insulation. The lower part, on which the inner tank rests, is of block cork, and the upper part of the insulation is of granulated cork.

Each inner sphere is 57 feet in diameter and made of a special steel with a .09 per cent carbon and 3½ per cent nickel content, and is entirely of arc welded construction.

The outer sphere is 63 feet in diameter, made of tank steel and carried by twelve legs resting on concrete foundations.

A new "toro-segmental" liquid storage tank is now being constructed, the inner nickel steel shell being 70 feet in diameter and 42 feet 10 inches high and the outer standard steel shell being 76 feet in diameter and 51 feet high. This new tank is cylindrical in shape but the top and bottom of the inner tank is of special design to provide for expansion and contraction.

Regasification

The regasification equipment consists of three special pumps, which raise the pressure of the liquid in the tanks to a pressure sufficient to force it into the three live steam liquid gas heaters or regasification units, and against the 30 lbs. per sq. in. gas gauge pressure carried in the city high pressure lines.

The cold gas from the regasification units goes to a heater, using exhaust steam from the pumps, for the purpose of raising temperature of the gas from about zero to about 50° F.

Boiler Plant

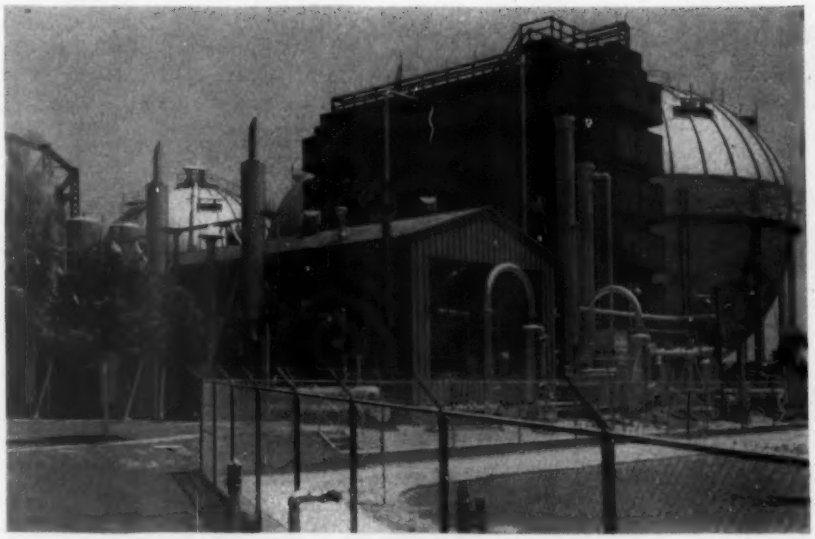
The site at which the above equipment was installed was already provided with a boiler plant suitable to produce 62,000 pounds of steam per hour. This boiler plant is now equipped for either natural gas firing during the liquefaction periods when excess natural gas is available, or for oil firing during regasification periods when there is a scarcity of gas.

Miscellaneous Parts

The remainder of the plant consists of the conventional water cooling towers, inner and after coolers, water pumps, air compressors, high pressure storage tanks for the liquid ethylene when the plant is not operating, and the other usual appliances of a gas compressor station.

All piping carrying gas or liquid colder than minus 50° F. is made of copper tubing with Van Stone joints using bronze flanges and bolts.

At every point possible automatic controls are used to regulate pressure, temperature, volume or engine speeds.



Compressor and Machinery Room, Carbolic Acid Gas and Moisture Extractors, and cooling tower with storage spheres in background.

General

In designing a natural gas liquefaction, storage and regasification plant, *the regasification rate* should be sufficient to supply the difference between the hourly transmission line delivery capacity and the maximum hourly peak demand and also for emergency demands.

The *liquid storage* must be large enough to supply the number peak hours per day for the greatest number of successive peak days with sufficient excess for safety during subsequent liquefaction periods during which the storage is refilled. The liquefaction plant should be of a size which will fill the storage in about sixty to ninety days.

The liquefaction plant's *rated daily capacity* can only be increased by building a complete new unit, whereas the storage and regasification capacities can easily be enlarged as demand requires.

The liquid gas scheme, which is patented, is in addition to other patent claims allowed, generally to liquefy natural gas delivered through the gas transmission equipment, when this equipment has excess capacity, store this liquefied gas and then regasify the liquid at times of increased demand, and deliver this gas to the distributing system.

The plant design will vary, depending mainly on the pressure at which natural gas is delivered to the plant inlet for liquefaction, the pressure desired in the regasified liquid, whether a steam plant and cooling water are available, and the most economical type of boiler fuel.

The plant cost will vary with the above items of design, as well as with freight rates, labor conditions, character of the soil for foundations, other variables and the local operating conditions.

The operating cost will depend on the local conditions and requirements, the amount of gas regasified annually, and the costs of labor, natural gas for the compressor engines, boiler fuel, supplies, expense, maintenance, repairs and miscellaneous items.

The Cleveland plant was built during the fall of 1940 and due to the successful operation of the plant during the two succeeding winters there has been no gas shortage in Cleveland on peak days or at other times. The new liquid storage tank now building is to take care of the large existing war loads on the distribution system.

Each installation requires a careful study of all the local conditions as above described, and the details of the plant design and construction will vary to suit such local conditions.

The contract for the entire original plant in Cleveland, as well as for the additional natural gas storage tank, was executed by The Gas Machinery Company of Cleveland, Ohio.

The natural gas liquefaction plant, the first of its kind in the world, went into service last winter successfully. There is now in the course of construction additional liquid storage capacity which, when completed, will almost double its usefulness.

The Gas Utility Industry in 1942

By

Arthur F. Bridge

President, American Gas Association,
Vice-President and General Manager,
Southern Counties Gas Company,
Los Angeles, California

Arthur F. Bridge

ACTUATED BY ONE PRIMARY MOTIVE — the strengthening and furthering of the nation's war effort— the gas industry in 1942 exerted every effort to increase America's war-time productive capacity to its maximum.

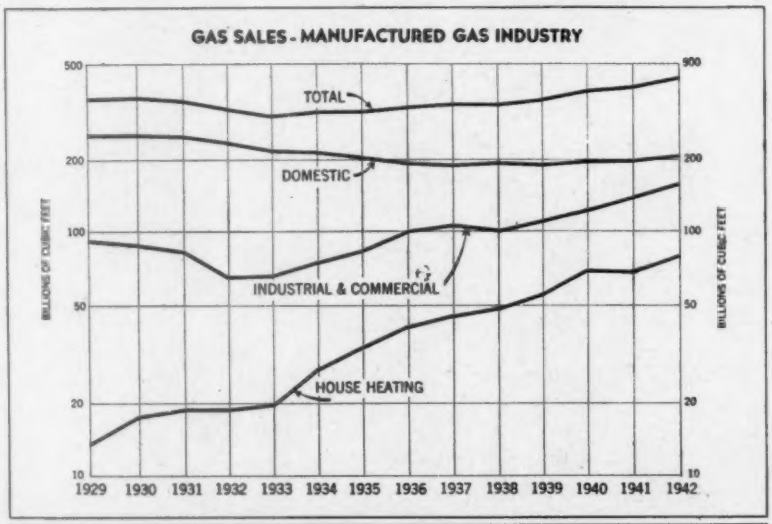
The outstanding development of the year was the mounting demands of war industries for gas fuel, approximately 25% of the present deliveries of natural gas and 15% of manufactured gas being used by war industries at the year end.

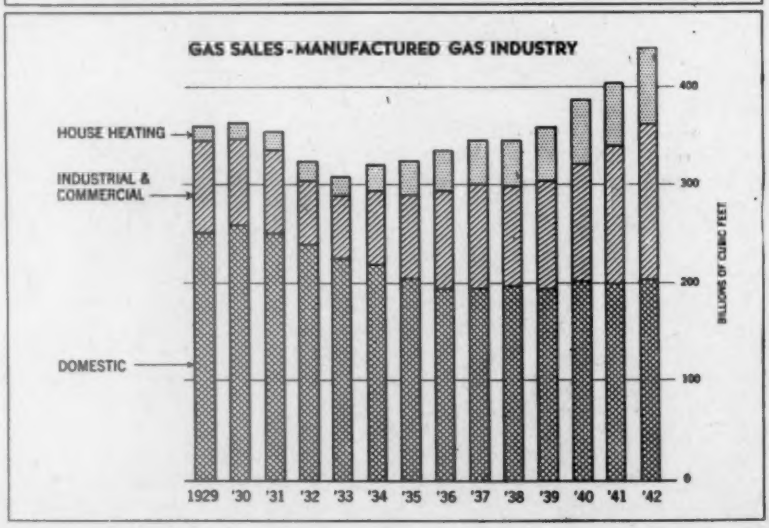
As a result of this accelerated use of gas in the fabrication of the implements of war, particularly the making of precision parts for guns, tanks, planes, ships, shells, etc., it became necessary during the latter part of the year for the War Production Board to issue orders limiting certain uses of natural and manufactured gas. Both orders prohibited new gas-heating installations in certain critical areas and provided for steps to be taken to curtail gas consumption in time of threatened shortages. Later the above orders were revised and tightened.

Issuance of these Limitation Orders by WPB was made necessary by the fact that gas companies were unable to obtain steel and other critical materials to expand present capacities to meet greatly increased demands for gas fuel. Other reasons for issuing the orders, as stated by WPB, were to alleviate the oil shortage and lighten transportation load.

Prior to the issuance of these orders, the American Gas Association, through its Committee on War Activities and Committee on Publicity and Advertising, had conferred frequently with WPB. An appeal to consumers to economize in the use of gas in order to save critical fuels and transportation and help avert gas shortages was made by WPB October 28. On November 16th the Association announced its support of WPB's gas conservation program and at the same time released to gas companies throughout the country a public educational campaign covering the conservation and curtailment of gas fuel. The keynote of this campaign was "Gas is a vital war material. Use it wisely." The gas industry's national advertising program also emphasized the need of conservation.

At the end of 1942, 19,249,000 customers, or the largest number ever connected to the mains of the industry, were being served with gas. This was an increase of 627,000 over the year 1941. Of this total, manufactured gas companies served 10,733,000 customers and the remaining 8,516,000 customers were served by natural gas companies.





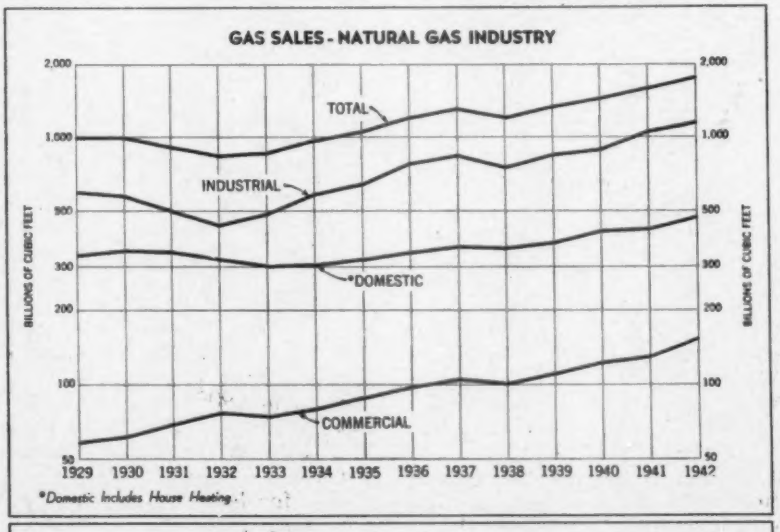
Revenues of the entire industry, both manufactured and natural, aggregated $995,045,000, a gain of 8.9 per cent over 1941. Natural gas companies grossed $584,533,000, a gain of 11.2 per cent, while manufactured gas companies were $410,512,000, or 5.7 per cent more than for 1941.

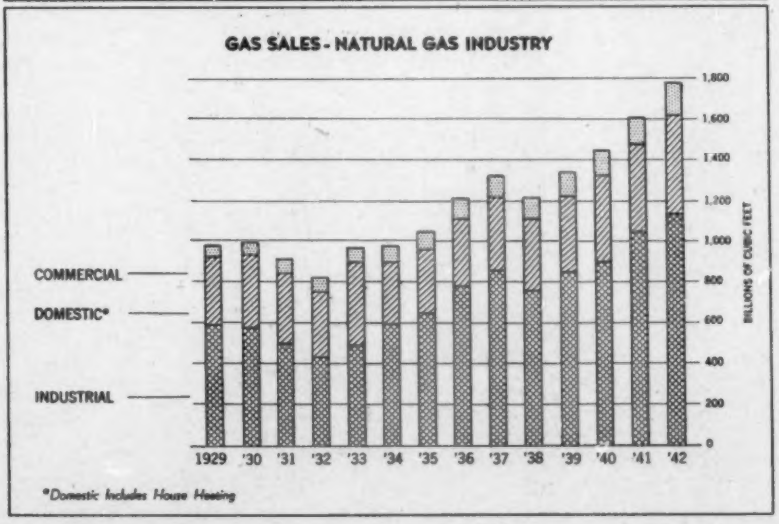
Industrial sales of natural gas registered an increase of 58,911,000,000 cubic feet at the end of 1942, bringing the total sales to 908,476,000,000 cubic feet. This was a percentage increase of 6.9. Sales of manufactured gas for industrial purposes were 93,275,000,000 cubic feet in 1942, or 17.5 per cent more than for the previous year.

In the household uses of gas, such as cooking, refrigeration, house heating, water heating, etc., manufactured gas companies sold 283,900,000,000 cubic feet, a gain of 6.7 per cent for the year. Gas consumed for house heating registered an increase of 17.3 per cent. Sales of natural gas for domestic uses registered an increase of 13.3 per cent—bringing the sale for that purpose to 479,274,000,000 cubic feet.

Indications are that the total production of natural gas in 1942, including amounts used in the manufacture of carbon black and for field purposes, will reach a total in excess of three trillion cubic feet. Some 232 billion cubic feet of natural gas were used as fuel for generating electric power in 1942, an increase of 29 billion cubic feet over 1941. In several instances, the above figures established new records.

Prompt action by the gas industry on matters originating with Government war agencies has been cleared through the Committee on War Activities of the American Gas Association. Activities coordinated and directed by this Committee, which is broadly representative of the natural and manufactured gas industries, have included salvage and the exchange of large quantities of materials and equipment by gas companies, the conservation of oil and tin, the preparation of handbooks on the protection of the gas industry, a study of the manpower situation, and various other emergency matters arising out of the war.



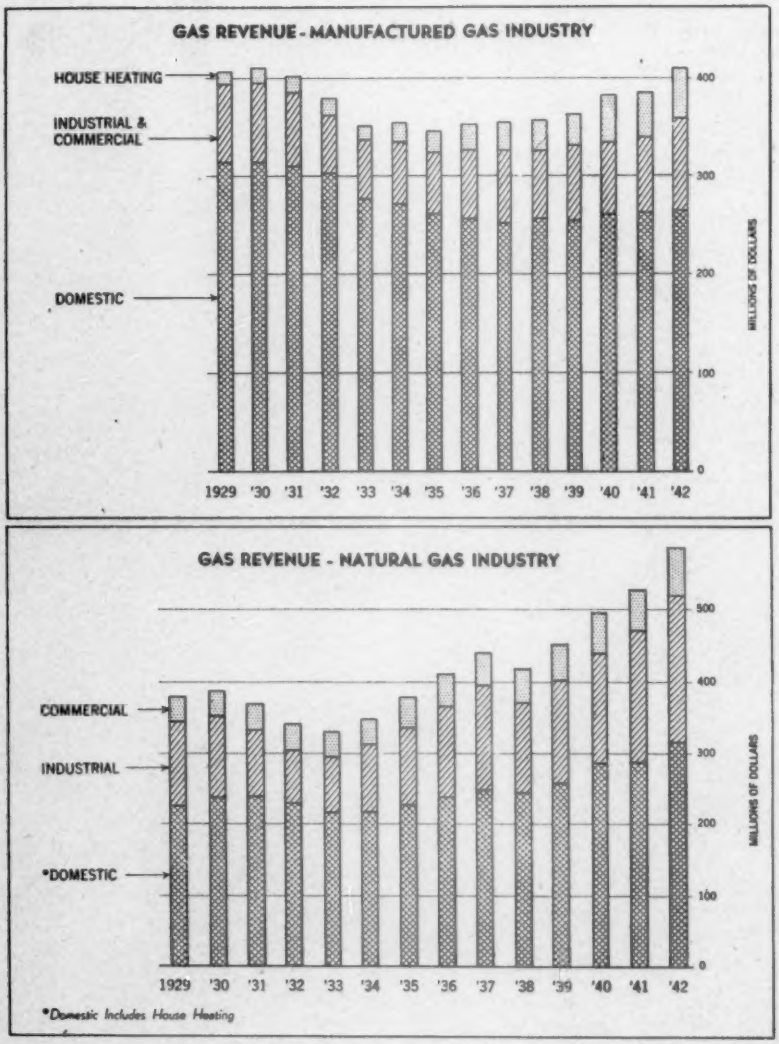


It is estimated that 55 per cent of the nation's productive capacity is being devoted to the prosecution of the war. In the all important metals field, where industrial gas is so extensively used, it is much greater. The transformation to a war-time basis has been accomplished in such manner as to cause no bottlenecks. In fact, all industry has experienced the quick conversion of industrial gas equipment. Too, new equipment has been available—thus facilitating new production peaks. The quality of American made implements of war has been acclaimed by all of the United Nations. Most war machines have hundreds of parts—each must be perfectly formed and of maximum strength. It is in the manufacture of these high quality parts that industrial gas is making its greatest contribution to the war production effort. The manufacture of high quality, interchangeable parts is the foundation of mass production, modern gas furnaces for forging, hardening, annealing, and other heat treatments make it possible to deliver such parts at ever increasing rates.

While many gas furnaces of special design are being installed to take care of unusual production problems, it is a significant fact that by far the greatest amount of production from gas equipment is in furnaces the designs of which were thoroughly tested out before the war started. This has been one of the chief reasons why deliveries of new industrial gas equipment have not been unduly delayed — why there have been no bottlenecks. On the other hand, where special designs of gas heating equipment have been deemed advisable and desirable, the industry has drawn on its store of research and engineering knowledge and quickly produced suitable automatic, heat treating machines that fit perfectly into the exacting requirements and are speeding the tempo of our vast war production plants.

It is evident that more and more emphasis will be placed on dehydrated food to supply our over-seas forces and lend-lease requirements. The clean, controllable qualities of gas are recognized by this expanding industry as highly desirable. During the important steps of storing and packaging dehydrate vegetables, fruits, and other foods, a development of the gas industry is being put to ever increasing use. This development, dehydrated air, protects the processed foods until they are permanently packed for shipment.

Toast affords an interesting sidelight on the feeding of men and wom-



en in this war. It is believed that ours is the first army to enjoy toasted bread as a regular menu item in all establishments except in the field. The familiar gas revolving toaster, seen in so many restaurants and lunch rooms, has gone to war, and is daily doing its share to maintain the strength of those men flying the planes and shouldering the guns.

Other specialized cooking appliances that have been developed within the gas industry during peace time are also hard at work preparing tasty food for the Army and Navy forces. For instance, gas-fired deep fat fryers are being used by the thousands. They are particularly popular with army cooks in preparing French fried potatoes, the kind most in demand by both sexes in the armed services.

Continuing the trend which began considerably more than a year ago, activities of the American Gas Association Testing Laboratories have been directed more and more to the demands of all-out war. After numerous preliminary contacts several assignments of a highly confidential nature were obtained from various branches of the armed forces. To properly handle them the War Products Department of the Testing Laboratories was established. A very substantial portion of the Laboratories equipment and staff is now devoted to essential war activities.

Close cooperation with the Office of the Petroleum Coordinator for War by natural gas companies brought about many developments during the year. Among the more outstanding were (1) the relaxing of restrictions to permit further drilling of wells in the Appalachian region, eastern Kansas, portions of Oklahoma and Missouri, thereby considerably relieving gas shortages in those areas; (2) use of the Playa del Rey oil field, near Los Angeles, as a reservoir to store 2 billion cubic feet of natural gas to be available during peak periods; (3) a thorough study of hydrocarbons and an increase in their production for use in 100-octane gasoline, synthetic rubber and other war products, with a minimum use of critical materials.

Home economics departments of gas companies throughout the nation were the first to support the government's national nutrition program. These departments have afforded full cooperation to such community organizations as the Red Cross, Civilian Defense groups and nutrition committees. Such organizations look to gas company home economics departments for reliable instruction and leadership, and as a headquarters for meetings and demonstrations. Their programs also have dealt with the care and use of gas equipment, and in the future will include conservation and food rationing.

Gas leads the domestic field for cooking purposes. This is revealed in a recently published analysis of the 1940 Census which discloses that 73% of the country's 20,291,512 occupied homes in urban territories reporting a cooking fuel utilized gas for cooking.

Wood, coal or coke, kerosene or gasoline, and not electricity represent the major potential markets for gas, the survey reveals. A total of 4,431,620 or 21.8%, of homes in urban territory report the use of one of these fuels for cooking purposes. Thus there is a large unsold and lucrative market for the sale of gas-cooking services.

That this market is being sold, and the use of gas for cooking is rapidly increasing in new homes built since the completion of the census, is clearly shown in the results of the American Gas Association's latest survey of new homes covering one and two-family houses other than government projects built during 1941. Some 90% of these new homes use gas for cooking. The survey covered one out of every three homes constructed in 1941.

Gas for house heating ranks second (coal and coke combined rank first) among the nation's fuels as the census further discloses that 3,122,577 homes in urban territories reported the use of gas for heating purposes as against 2,260,556 using oil. The American Gas Association's study further indicates that 59% of the new homes constructed in 1941, covered in the above mentioned survey, report the choice of gas for house heating.

Gas is also a preferred fuel in the defense housing projects sponsored by the various governmental agencies. A recapitulation of 325 such projects constructed as of December 1, 1942, shows that gas is used by 85% for cooking, 81% for water

(Concluded on page 42)

Which way to the FRONT?

Which front? "Fighting front"? "Production front"? "Home front"?

No longer are lines of battle clearly defined. And, upon men without uniform fall responsibilities fully as grave as those of any man behind a gun.

Upon you, for example, the Nation depends to supply the fuel to insure the health and well-being of

our workers . . . to supply our shipyards, mills and factories from which come the myriad war products made tougher and built faster by gas. There are no fronts more vital than these!

And, it should be a source of especial personal pride to you that your efforts mean so much — and have succeeded so well.

Stay on that job; give it all you have! And, when Victory's won, few will be able to show a better war record.

LAVINO "ACTIVATED" OXIDES

GREATER CAPACITY . . . GREATER ACTIVITY . . . LESS OXIDE REMOVES MORE H_2S!

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1528 WALNUT ST., PHILADELPHIA, PA.

Lavino's participation in the great industry-wide war program is in the saving of material, time and labor in gas purification for many leading gas companies . . . A contribution valuable in peactime, of vastly increased importance now.

LAVINO ACTIVATED OXIDE

Simplified Heat Calculation Method for Gravity and Forced Air Gas Furnaces

By
Fred A. Herr

EVER SINCE gas became the primary fuel for heating homes in Southern California, the problem of getting salesmen of gas heating appliances to provide home owners with heating units of adequate size has been one of the major unsolved problems.

In the past much confusion has been generated in the minds of home owners who were merely trying to ascertain what equipment to purchase in order to heat their homes adequately. The confusion resulted largely because prices and specifications quoted by different concerns varied so widely that often home owners were at a loss what to buy.

Many solutions to this problem were suggested. Some were tried out and enjoyed varying degrees of success. It was not until 1942 when the Institute of Gas Heating Industries of Southern California, in collaboration with the Southern California Gas Co. and with the technical assistance and approval of the Heating & Ventilating Division of the Los Angeles Building & Safety Department, undertook to solve the problem, that any degree of success was achieved.

The system of adequate heat calculation which has been developed is reported to have resulted in such success in Southern California that it has been made relatively simple for salesmen of gas heating appliances to provide the home owner with the proper type and size of equipment.

Simplified Calculation

The primary need in solving the problem, it was realized, was to provide a method of calculating heat losses or heat inputs to appliances which would eliminate the necessity for salesmen to master involved mathematical calculations. This has been accomplished under the method which has been adopted and is now in use.

In order to complete the simplified sizing plan it was found that a simplified method for sizing warm air ducts and warm air registers had necessarily to be included. Work on this part of the project, although not complete, is reported as being well on the way to being solved and is expected to be in use in the near future.

The simplified method of calculating inputs to gas warm-air furnaces was designed by making certain assumptions based on experience. The assumptions were judged by a committee from the Institute of Gas Heating Industries and pronounced to be sound.

While the system of calculation, as detailed in this article, and the charts that go with them, are designed to meet Southern California weather conditions and a temperature difference suitable to that area, the method as a whole is applicable to any section of the country with the necessary changes in charts and assumptions to fit other areas. Ed.

While it was recognized that no simplified or average method of determining heat losses or heat inputs would be absolutely accurate for all cases, the developers of the Southern California system of calculations believe that the results obtained by their method will be well within reasonable limits of the results obtained by accepted and more complex methods.

Sizing Kit

A sizing kit has been designed for applying the method of simplified heat calculations and now forms a part of the equipment of gas heating salesmen in the Southern California area. The kit consists of a book of "Heating Survey and Calculation" sheets, 8½ by 11 inches in dimension. Inserted in a pocket affixed to the inside back cover are six sizing and input calculation charts. These charts make possible simple and speedy calculation without resort to involved mathematics.

Printed on the inside of the front cover of the kit is a table of B.t.u. inputs per square foot of exposed surface area. This table presents for the salesman's benefit in easily understandable style the types in which houses fall by virtue of their wall, roof and floor construction. This table also indicates the coefficient and the input factor which has been worked out for each type of construction, and the input factor for leakage.

The system is designed for domestic heating only for use in Southern California inasmuch as the kit and the charts are based on a temperature differential of 40% and for weather conditions experienced in the Southern California area. The following assumptions were made in designing the sizing kit:

1. **Appliance efficiency, 70%.**
2. **Duct efficiency, 83%.**
3. **Number of air changes per hour, four.**
4. **Fresh air, 100%.**
5. **Temperature difference, 40%.**

Types of construction most common to the Southern California area have been classified and the average transmission coefficients for each one have been determined by use of data contained in the American Society of Heating & Ventilating Engineers' Guide. The transmission coefficients are listed on the inside front cover of the heating kit for easy reference. Any unusual conditions found in buildings, or any building which is out of the ordinary, it was realized while the calculating method was being designed, must be studied by a recognized heating engineer regardless of the method used for determining losses.

Input Factor Derivative

From the ASHVE Guide data it was possible to determine input factors for each type of construction in Southern California which had to be considered for inclusion in the system. These input factors were derived as follows:

The coefficient for windows, doors

EXPOSED WALLS CHART "A"

TEMPERATURE RISE 40° FAHR. FRESH AIR 100%

GRAVITY OR FORCED AIR GAS FURNACES ONE OR TWO STORIES

WALL CONSTRUCTION	WALL HEIGHT	LINEAL FEET OF EXPOSED WALL 1' to 30'																												
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
TYPE 1H, Stucco, Paper, Studs (Studs Exposed)	8	616	1232	1848	2464	3080	3696	4312	4928	5544	6160	6776	7392	8008	8624	9240	9856	10472	11088	11704	12320	12936	13552	14168	14784	15400	16016	16632	17248	17864	18480
	8½	655	1309	1964	2618	3273	3927	4582	5236	5891	6545	7200	7854	8509	9163	9818	10472	11127	11781	12436	13090	13745	14399	15054	15708	16363	17017	17672	18326	18981	19635
	9	693	1386	2079	2772	3465	4158	4851	5544	6237	6930	7623	8316	9009	9702	10395	11088	11781	12474	13167	13860	14553	15246	15939	16632	17325	18018	18711	19404	20097	20790
TYPE 2H, Stucco, Paper, Studs Lath and Plaster	8	208	416	624	832	1040	1248	1456	1664	1872	2080	2288	2496	2704	2912	3120	3328	3536	3744	3952	4160	4368	4576	4784	4992	5200	5408	5616	5824	6032	6240
	8½	221	442	663	884	1105	1326	1547	1768	1989	2210	2431	2652	2873	3094	3315	3536	3757	3978	4199	4420	4641	4862	5083	5304	5525	5746	5967	6188	6409	6630
	9	234	468	702	936	1170	1404	1638	1872	2106	2340	2574	2808	3042	3276	3510	3744	3978	4212	4446	4680	4914	5148	5382	5616	5850	6084	6318	6552	6786	7020
TYPE 3H, Stucco, Paper Sheathing or Wood Siding, Paper or Wood Shingles or Shakes or 8" Brick furred and all with Studs, Lath and Plaster.	8	176	352	528	704	880	1056	1232	1408	1584	1760	1936	2112	2288	2464	2640	2816	2992	3168	3344	3520	3696	3872	4048	4224	4400	4576	4752	4928	5104	5280
	8½	187	374	561	748	935	1122	1309	1496	1683	1870	2057	2244	2431	2618	2805	2992	3179	3366	3553	3740	3927	4114	4301	4488	4675	4862	5049	5236	5423	5610
	9	198	396	594	792	990	1188	1386	1584	1782	1980	2178	2376	2574	2772	2970	3168	3366	3564	3762	3960	4158	4356	4554	4752	4950	5148	5346	5544	5742	5940
TYPE 4H, Brick Veneer, Paper Sheathing or Wood Siding or Shingles, Paper Sheathing and all with Lath and Plaster.	8	126	272	408	544	680	816	952	1088	1224	1360	1496	1632	1768	1904	2040	2176	2312	2448	2584	2720	2856	2992	3128	3264	3400	3536	3672	3808	3944	4080
	8½	145	289	434	578	723	867	1012	1156	1301	1445	1590	1734	1879	2023	2168	2312	2457	2601	2746	2890	3035	3179	3324	3468	3613	3757	3902	4046	4191	4335
	9	153	306	459	612	765	918	1071	1224	1377	1530	1683	1836	1989	2142	2295	2448	2601	2754	2907	3060	3213	3366	3519	3672	3825	3978	4131	4284	4437	4590

WALL CONSTRUCTION	WALL HEIGHT	LINEAL FEET OF EXPOSED WALL 31' to 60'																												
		31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60
TYPE 1H, Stucco, Paper, Studs (Studs Exposed)	8	19096	19712	20328	20944	21560	22176	22792	23408	24024	24640	25256	25872	26488	27104	27720	28336	28952	29568	30184	30800	31416	32032	32648	33264	33880	34496	35112	35728	36344	36960
	8½	20290	20944	21599	22253	22908	23562	24217	24871	25526	26180	26835	27489	28144	28798	29453	30107	30762	31416	32071	32725	33380	34034	34689	35343	35998	36652	37307	37961	38616	39270
	9	21483	22176	22869	23562	24255	24948	25641	26334	27027	27720	28413	29106	29799	30492	31185	31878	32571	33264	33957	34650	35343	36036	36729	37422	38115	38808	39501	40194	40887	41580
TYPE 2H, Stucco, Paper, Studs Lath and Plaster	8	6448	6656	6864	7072	7280	7488	7696	7904	8112	8320	8528	8736	8944	9152	9360	9568	9776	9984	10192	10400	10608	10816	11024	11232	11440	11648	11856	12064	12272	12480
	8½	6851	7072	7293	7514	7735	7956	8177	8398	8619	8840	9061	9282	9503	9724	9945	10166	10387	10608	10829	11050	11271	11492	11713	11934	12155	12376	12597	12818	13039	13260
	9	7254	7488	7722	7956	8190	8424	8658	8892	9126	9360	9594	9828	10062	10296	10530	10764	10998	11232	11466	11700	11934	12168	12402	12636	12870	13104	13338	13572	13806	14040
TYPE 3H, Stucco, Paper, Sheathing or Wood Siding, Paper or Wood Shingles or Shakes or 8" Brick furred and all with Studs, Lath and Plaster.	8	5456	5632	5808	5984	6160	6336	6512	6688	6864	7040	7216	7392	7568	7744	7920	8096	8272	8448	8624	8800	8976	9152	9328	9504	9680	9856	10032	10208	10384	10560
	8½	5797	5984	6171	6358	6545	6732	6919	7106	7293	7480	7667	7854	8041	8228	8415	8602	8789	8976	9163	9350	9537	9724	9911	10098	10285	10472	10659	10846	11033	11220
	9	6138	6336	6534	6732	6930	7128	7326	7524	7722	7920	8118	8316	8514	8712	8910	9108	9306	9504	9702	9900	10098	10296	10494	10692	10890	11088	11286	11484	11682	11880
TYPE 4H, Brick Veneer, Paper Sheathing or Wood Siding or Shingles, Paper Sheathing and all with Lath and Plaster.	8	4216	4352	4488	4624	4760	4896	5032	5168	5304	5440	5576	5712	5848	5984	6120	6256	6392	6528	6664	6800	6936	7072	7208	7344	7480	7616	7752	7888	8024	8160
	8½	4480	4624	4768	4913	5058	5202	5347	5491	5636	5780	5925	6069	6214	6358	6503	6647	6792	6936	7081	7225	7370	7514	7659	7803	7948	8092	8237	8381	8526	8670
	9	4743	4896	5049	5202	5355	5508	5661	5814	5967	6120	6273	6426	6579	6732	6885	7038	7191	7344	7497	7650	7803	7956	8109	8262	8415	8568	8721	8874	9027	9180

SIMPLIFIED SIZING — HEATING INSTITUTE L.A. 9-1-42

CEILING AND FLOOR CHART "B"

TEMPERATURE RISE 40° FAHR. FRESH AIR 100%

GRAVITY OR FORCED AIR GAS FURNACES ONE STORY

LINEAL FEET		3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
3	1H	774	1032	1290	1548	1806	2064	2322	2580	2838	3096	3354	3612	3870	4128	4386	4644	4902	5160	5418	5676	5934	6192	6450	6708	6966	7224	7482	7740
	2H	315	420	525	630	735	840	945	1050	1155	1260	1365	1470	1575	1680	1785	1890	1995	2100	2205	2310	2415	2520	2625	2730	2835	2940	3045	3150
4	1H	1376	1720	2064	2408	2752	3096	3440	3784	4128	4472	4816	5160	5504	5848	6192	6536	6880	7224	7568	7912	8256	8600	8944	9288	9632	9976	10320	
4	2H	560	700	840	980	1120	1260	1400	1540	1680	1820	1960	2100	2240	2380	2520	2660	2800	2940	3080	3220	3360	3500	3640	3780	3920	4060	4200	
5	1H	2150	2580	3010	3440	3870	4300	4730	5160	5590	6020	6450	6880	7310	7740	8170	8600	9030	9460	9890	10320	10750	11180	11610	12040	12470	12900		
5	2H	875	1050	1225	1400	1575	1750	1925	2100	2275	2450	2625	2800	2975	3150	3325	3500	3675	3850	4025	4200	4375	4550	4725	4900	5075	5250		
6	1H	3096	3612	4128	4644	5160	5676	6192	6708	7224	7740	8256	8772	9288	9804	10320	10836	11352	11868	12384	12900	13416	13932	14448	14964	15480			
6	2H	1260	1470	1680	1890	2100	2310	2520	2730	2940	3150	3360	3570	3780	3990	4200	4410	4620	4830	5040	5250	5460	5670	5880	6090	6300			
7	1H	4214	4816	5418	6020	6622	7224	7826	8428	9030	9632	10234	10836	11438	12040	12642	13244	13846	14448	15050	15652	16254	16856	17458	18060				
7	2H	1715	1960	2205	2450	2695	2940	3185	3430	3675	3920	4165	4410	4655	4900	5145	5390	5635	5880	6125	6370	6615	6860	7105	7350				
8	1H	5504	6192	6880	7568	8256	8944	9632	10320	11008	11696	12384	13072	13760	14448	15136	15824	16512	17200	17888	18576	19264	20124	20898	21672	22446	23220		
8	2H	2240	2520	2800	3080	3360	3640	3920	4200	4480	4760	5040	5320	5600	5880	6160	6440	6720	7000	7280	7560	7840	8120	8400					
9	1H	6966	7740	8514	9288	10062	10836	11610	12384	13158	13932	14706	15480	16254	17028	17802	18576	19350	20124	20898	21672	22446	23220						
9	2H	2835	3150	3465	3780	4095	4410	4725	5040	5355	5670	5985	6300	6615	6930	7245	7560	7875	8190	8505	8820	9135	9450						
10	1H	8600	9460	10320	11180	12040	12900	13760	14620	15480	16340	17200	18060	18920	19780	20640	21500	22360	23220	24080	24940	25800							
10	2H	3500	3850	4200	4550	4900	5250	5600	5950	6300	6650	7000	7350	7700	8050	8400	8750	9100	9450	9800	10150	10500							
11	1H	10406	11352	12298	13244	14190	15136	16082	17028	17974	18920	19866	20812	21758	22704	23650	24596	25542	26488	27434	28380								
11	2H	4235	4620	5005	5390	5775	6160	6545	6930	7315	7700	8085	8470	8855	9240	9625	10010	10395	10780	11165	11550								
12	1H	12384	13416	14448	15480	16512	17544	18576	19608	20640	21672	22704	23736	24768	25800	26832	27864	28896	29928	30960									
12	2H	5040	5460	5880	6300	6720	7140	7560	7980	8400	8820	9240	9660	10080	10500	10920	11340	11760	12180	12600									
13	1H	14534	15652	16770	17888	19006	20124	21242	22360	23478	24596	25714	26832	27950	29068	30186	31304	32422	33540										
13	2H	3915	6370	6825	7280	7735	8190	8645	9100	9555	10010	10465	10920	11375	11830	12285	12740	13195	13650										
14	1H	16856	18060	19264	20468	21672	22876	24080	25284	26488	27692	28896	30100	31304	32508	33712	34916	36120											
14	2H	6860	7350	7840	8330	8820	9310	9800	10290	10780	11270	11760	12250	12740	13230	13720	14210	14700											
15	1H	19350	20640	21930	23220	24510	25800	27090	28380	29670	30960	32250	33540	34830	36120	37410	38700												
15	2H	7875	8400	8925	9450	9975	10500	11025	11550	12075	12600	13125	13650	14175	14700	15225	15750												
16	1H	22016	23392	24768	26144	27520	28896	30272	31648	33024	34400	35776	37152	38528	39904	41280													
16	2H	8960	9520	10080	10640	11200	11760	12320	12880	13440	14000	14560	15120	15680	16240	16800													
17	1H	24854	26366	27778	29240	30702	32164	33626	35088	36550	38012	39474	40936	42398	43860														
17	2H	10115	10710	11305	11900	12495	13090	13685	14280	14875	15470	16065	16660	17255	17850														
18	1H	27864	29412	30960	32508	34056	35604	37152	38700	40248	41796	43344	44892	46440															
18	2H	11340	11970	12600	13230	13860	14490	15120	15750	16380	17010	17640	18270	18900															
19	1H	31046	32680	34314	35948	37582	39216	40850	42484	44118	45752	47386	49020																
19	2H	12635	13300	13965	14630	15295	15960	16625	17290	17955	18620	19285	19950																
20	1H	34400	36120	37840	39560	41280	43000	44720	46440	48160	49880	51600																	
20	2H	14000	14700	15400	16100	16800	17500	18200	18900	19600	20300	21000																	

SIMPLIFIED SIZING — HEATING INSTITUTE L.A. 9-1-42

FLOOR CHART "B"—1

TEMPERATURE RISE 40° FAHR. FRESH AIR 100%

GRAVITY OR FORCED AIR GAS FURNACES TWO STORY ONLY

Lineal Feet	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
3		81	108	135	162	189	216	243	270	297	324	351	378	405	432	459	486	513	540	567	594	621	648	675	702	729	756	783	810
4	4		144	180	216	252	288	324	360	396	432	468	504	540	576	612	648	684	720	756	792	828	864	900	936	972	1008	1044	1080
5		5		225	270	315	360	405	450	495	540	585	630	675	720	765	810	855	900	945	990	1035	1080	1125	1170	1215	1260	1305	1350
6			6		324	378	432	486	540	594	648	702	756	810	864	918	972	1026	1080	1134	1188	1242	1296	1350	1404	1458	1512	1566	1620
7				7		441	504	567	630	693	756	819	882	945	1008	1071	1134	1197	1260	1323	1386	1449	1512	1575	1638	1701	1764	1827	1890
8					8		576	648	720	792	864	936	1008	1080	1152	1224	1296	1368	1440	1512	1584	1656	1728	1800	1872	1944	2016	2088	2160
9						9		729	810	891	972	1053	1134	1215	1296	1377	1458	1539	1620	1701	1782	1863	1944	2025	2106	2187	2268	2349	2430
10							10		900	990	1080	1170	1260	1350	1440	1530	1620	1710	1800	1890	1980	2070	2160	2250	2340	2430	2520	2610	2700
11								11		1089	1188	1287	1386	1485	1584	1683	1782	1881	1980	2079	2178	2277	2376	2475	2574	2673	2772	2871	2970
12									12		1296	1404	1512	1620	1728	1836	1944	2052	2160	2268	2376	2484	2592	2700	2808	2916	3024	3132	3240
13										13		1521	1638	1755	1872	1989	2106	2223	2340	2457	2574	2691	2808	2925	3042	3159	3276	3393	3510
14											14		1764	1890	2016	2142	2268	2394	2520	2646	2772	2898	3024	3150	3276	3402	3528	3654	3780
15												15		2025	2160	2295	2430	2565	2700	2835	2970	3105	3240	3375	3510	3645	3780	3915	4050
16													16		2304	2448	2592	2736	2880	3024	3168	3312	3456	3600	3744	3888	4032	4176	4320
17														17		2601	2754	2907	3060	3213	3366	3519	3672	3825	3978	4131	4284	4437	4590
18															18		2916	3078	3240	3402	3564	3726	3888	4050	4212	4374	4536	4698	4860
19																19		3249	3420	3591	3762	3933	4104	4275	4446	4617	4788	4959	5130
20																	20		3600	3780	3960	4140	4320	4500	4680	4860	5040	5220	5400

SIMPLIFIED SIZING — HEATING INSTITUTE L.A. 9-1-42

CEILING CHART "B"—2

TEMPERATURE RISE 40° FAHR. FRESH AIR 100%

GRAVITY OR FORCED AIR GAS FURNACES TWO STORY ONLY

Lineal Feet		3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
3	1H	693	924	1155	1386	1617	1848	2079	2310	2541	2772	3003	3234	3465	3696	3927	4158	4389	4620	4851	5082	5313	5544	5775	6006	6237	6468	6699	6930
	2H	234	312	390	468	546	624	702	780	858	936	1014	1092	1170	1248	1326	1404	1482	1560	1638	1716	1794	1872	1950	2028	2106	2184	2262	2340
4	1H	1232	1540	1848	2156	2464	2772	3080	3388	3696	4004	4312	4620	4928	5236	5544	5852	6160	6468	6776	7084	7392	7700	8008	8316	8624	8932	9240
	2H	416	520	624	728	832	936	1040	1144	1248	1352	1456	1560	1664	1768	1872	1976	2080	2184	2288	2392	2496	2600	2704	2808	2912	3016	3120
5	1H	1925	2310	2695	3080	3465	3850	4235	4620	5005	5390	5775	6160	6545	6930	7315	7700	7985	8370	8755	9140	9525	9910	10295	10680	11165	11550		
	2H	650	780	910	1040	1170	1300	1430	1560	1690	1820	1950	2080	2210	2340	2470	2600	2730	2860	2990	3120	3250	3380	3510	3640	3770	3900		
6	1H	2772	3234	3696	4158	4620	5082	5544	6006	6468	6930	7392	7854	8316	8778	9240	9702	10164	10626	11088	11550	12012	12474	12936	13398	13860			
	2H	936	1092	1248	1404	1560	1716	1872	2028	2184	2340	2496	2652	2808	2964	3120	3276	3432	3588	3744	3900	4056	4212	4368	4524	4680			
7	1H	3773	4312	4851	5390	5929	6468	7007	7546	8085	8624	9163	9702	10241	10780	11319	11858	12397	12936	13475	14014	14553	15092	15631	16170				
	2H	1274	1456	1638	1820	2002	2184	2366	2548	2730	2912	3094	3276	3458	3640	3822	4004	4186	4368	4550	4732	4914	5096	5278	5460				
8	1H	4928	5544	6160	6776	7392	8008	8624	9240	9856	10472	11088	11704	12320	12936	13552	14168	14784	15400	16016	16632	17248	17864	18480					
	2H	1664	1872	2080	2288	2496	2704	2912	3120	3328	3536	3744	3952	4160	4368	4576	4784	4992	5200	5408	5616	5824	6032	6240					
9	1H	6237	6930	7623	8316	9009	9702	10395	11088	11781	12474	13167	13860	14553	15246	15939	16632	17325	18018	18711	19404	20097	20790						
	2H	2106	2340	2574	2808	3042	3276	3510	3744	3978	4212	4446	4680	4914	5148	5382	5616	5850	6084	6318	6552	6786	7020						
10	1H	7700	8470	9240	10010	10780	11550	12320	13090	13860	14630	15400	16170	16940	17710	18480	19250	20020	20790	21560	22330	23100							
	2H	2600	2860	3120	3380	3640	3900	4160	4420	4680	4940	5200	5460	5720	5980	6240	6500	6760	7020	7280	7540	7800							
11	1H	9317	10164	11011	11858	12705	13552	14399	15246	16093	16940	17787	18634	19481	20328	21175	22022	22869	23716	24563	25410								
	2H	3146	3432	3718	4004	4290	4576	4862	5148	5434	5720	6006	6292	6578	6864	7150	7436	7722	8008	8294	8580								
12	1H	11088	12012	12936	13860	14784	15708	16632	17556	18480	19404	20328	21252	22176	23100	24024	24948	25872	26796	27720									
	2H	3744	4056	4368	4680	4992	5304	5616	5928	6240	6552	6864	7176	7488	7800	8112	8424	8736	9048	9360									
13	1H	13013	14014	15015	16016	17017	18018	19019	20020	21021	22022	23023	24024	25025	26026	27027	28028	29029	30030										
	2H	4394	4732	5070	5408	5746	6084	6422	6760	7098	7436	7774	8112	8450	8788	9126	9464	9802	10140										
14	1H	15092	16170	17248	18326	19404	20482	21560	22638	23716	24794	25872	26950	28028	29106	30184	31262	32340											
	2H	5096	5460	5824	6188	6552	6916	7280	7644	8008	8372	8736	9100	9464	9828	10192	10556	10920											
15	1H	17325	18480	19635	20790	21945	23100	24255	25410	26565	27720	28875	30030	31185	32340	33495	34650												
	2H	5850	6240	6630	7020	7410	7800	8190	8580	8970	9360	9750	10140	10530	10920	11310	11700												
16	1H	19712	20944	22176	23408	24640	25872	27104	28336	29568	30800	32032	33264	34496	35728	36960													
	2H	6656	7072	7488	7904	8320	8736	9152	9568	9984	10400	10816	11232	11648	12064	12480													
17	1H	22253	23562	24871	26180	27489	28798	30107	31416	32725	34034	35343	36652	37961	39270														
	2H	7514	7956	8398	8840	9282	9724	10166	10608	11050	11492	11934	12376	12818	13260														
18	1H	24948	26334	27720	29106	30492	31878	33264	34650	36036	37422	38808	40194	41580															
	2H	8424	8892	9360	9828	10296	10764	11232	11700	12168	12636	13104	13572	14040															
19	1H	27797	29280	30723	32186	33640	35112	36575	38038	39501	40964	42427	43890																
	2H	9386	9880	10374	10868	11362	11856	12350	12844	13338	13832	14326	14820																
20	1H	30800	32340	33880	35420	36960	38500	40040	41580	43120	44660	46200																	
	2H	10400	10920	11440	11960	12480	13000	13520	14040	14560	15080	15600																	

SIMPLIFIED SIZING — HEATING INSTITUTE L.A. 9-1-42

DOORS AND WINDOWS CHART "C" — **TEMPERATURE RISE 40° FAHR. FRESH AIR 100%** — **GRAVITY OR FORCED AIR GAS FURNACES ONE AND TWO STORIES**

LINEAL FEET	2′	2′-6″	3′	3′-6″	4′	4′-6″	5′	5′-6″	6′	6′-6″	7′	7′-6″	8′	8′-6″	9′	9′-6″	10′
1′	108	135	162	189	216	243	270	297	324	351	378	405	432	459	486	513	540
1′-6″	162	203	243	284	324	365	405	446	486	527	567	608	648	689	729	770	810
2′	216	270	324	378	432	486	540	594	648	702	756	810	864	918	972	1026	1080
2′-6″	270	338	405	473	540	608	675	743	810	878	945	1013	1080	1148	1215	1283	1350
3′	324	405	486	567	648	729	810	891	972	1053	1134	1215	1296	1377	1458	1539	1620
3′-6″	378	473	567	662	756	851	945	1041	1135	1230	1324	1419	1513	1608	1702	1797	1890
4′	432	540	648	756	864	972	1080	1188	1296	1404	1512	1620	1728	1836	1944	2052	2160
4′-6″	486	608	729	851	972	1094	1215	1337	1458	1580	1701	1823	1944	2067	2187	2309	2430
5′	540	675	810	945	1080	1215	1350	1485	1620	1755	1890	2025	2160	2295	2430	2565	2700

SIMPLIFIED SIZING — HEATING INSTITUTE L.A. 9-1-42

CUBICAL CONTENTS CHART "D" — **TEMPERATURE RISE 40° FAHR. FRESH AIR 100%** — **GRAVITY OR FORCED AIR GAS FURNACES ONE STORY**

LINEAL FEET	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
3	8	209	278	348	418	487	557	626	696	766	835	905	974	1044	1114	1183	1253	1322	1392	1462	1531	1601	1670	1740	1810	1879	1949	2018	2088
	8½	222	296	370	444	518	592	666	740	814	888	962	1036	1110	1184	1258	1332	1406	1480	1554	1628	1702	1776	1850	1924	1998	2072	2146	2220
	9	235	313	392	470	548	626	705	783	861	940	1018	1096	1175	1253	1331	1409	1488	1566	1644	1723	1801	1879	1958	2036	2114	2192	2271	2349
4	4	8	371	464	557	650	742	835	928	1021	1114	1207	1299	1392	1485	1578	1670	1763	1856	1949	2042	2134	2227	2320	2413	2506	2598	2691	2784
		8½	394	493	592	690	789	887	986	1085	1183	1282	1380	1479	1578	1676	1775	1873	1972	2071	2169	2268	2366	2465	2564	2662	2761	2859	2958
		9	418	522	626	731	835	940	1044	1148	1253	1357	1462	1566	1670	1775	1879	1984	2088	2192	2297	2401	2506	2610	2714	2819	2923	3028	3132
5		5	8	580	696	812	928	1044	1160	1276	1392	1508	1624	1740	1856	1972	2088	2204	2320	2436	2552	2668	2784	2900	3016	3132	3248	3364	3480
			8½	616	740	863	986	1109	1232	1356	1479	1602	1725	1848	1972	2095	2218	2341	2464	2588	2711	2834	2957	3080	3204	3327	3450	3573	3696
			9	653	783	914	1044	1175	1305	1436	1566	1697	1827	1958	2088	2219	2349	2480	2610	2741	2871	3002	3132	3263	3393	3524	3654	3785	3915
6			8	535	974	1114	1253	1392	1581	1670	1810	1949	2088	2227	2366	2506	2644	2784	2923	3062	3202	3341	3480	3619	3758	3898	4037	4176
		6	8½	887	1035	1183	1331	1479	1627	1775	1923	2071	2219	2366	2514	2662	2810	2958	3106	3254	3402	3550	3698	3845	3993	4141	4289	4437
			9	940	1096	1253	1409	1566	1723	1879	2036	2192	2349	2506	2662	2819	2975	3132	3289	3445	3602	3758	3915	4072	4228	4385	4541	4698
7				8	1137	1299	1462	1624	1786	1949	2111	2274	2436	2598	2761	2923	3086	3248	3410	3573	3735	3898	4060	4222	4385	4547	4710	4872
			7	8½	1208	1380	1553	1725	1898	2070	2243	2415	2588	2760	2933	3105	3278	3450	3623	3795	3968	4140	4313	4485	4658	4830	5003	5175
				9	1279	1462	1644	1827	2010	2192	2375	2558	2741	2923	3106	3289	3471	3654	3837	4019	4202	4385	4568	4750	4933	5116	5298	5481
8					8	1485	1670	1856	2042	2227	2413	2598	2784	2970	3155	3341	3526	3712	3898	4083	4269	4454	4640	4826	5011	5197	5382	5568
				8	8½	1578	1775	1972	2169	2366	2563	2760	2957	3155	3352	3549	3746	3943	4140	4337	4534	4731	4928	5126	5323	5520	5717	5914
					9	1670	1879	2088	2297	2506	2714	2923	3132	3341	3550	3758	3967	4176	4385	4594	4802	5011	5220	5429	5638	5846	6055	6264
9						8	1879	2088	2297	2506	2714	2923	3132	3341	3550	3758	3967	4176	4385	4594	4802	5011	5220	5429	5638	5846	6055	6264
					9	8½	1997	2219	2440	2662	2884	3106	3328	3549	3771	3993	4215	4437	4658	4880	5102	5324	5546	5767	5989	6211	6433	6655
						9	2114	2349	2584	2819	3054	3289	3524	3758	3993	4228	4463	4698	4933	5168	5403	5638	5873	6107	6342	6577	6812	7047
10							8	2320	2552	2784	3016	3248	3480	3712	3944	4176	4408	4640	4872	5104	5336	5568	5800	6032	6264	6496	6728	6960
						10	8½	2465	2712	2958	3205	3451	3698	3944	4191	4437	4684	4930	5177	5423	5670	5916	6163	6409	6656	6902	7149	7395
							9	2610	2871	3132	3393	3654	3915	4176	4437	4698	4959	5220	5481	5742	6003	6264	6525	6786	7047	7308	7569	7830
11								8	2807	3062	3318	3573	3828	4083	4338	4594	4849	5104	5359	5614	5870	6125	6380	6635	6890	7146	7401	7656
							11	8½	2983	3254	3525	3796	4067	4338	4609	4880	5152	5423	5694	5965	6238	6507	6778	7049	7320	7591	7863	8134
								9	3158	3445	3732	4019	4307	4594	4881	5168	5455	5742	6029	6316	6603	6890	7178	7465	7752	8039	8326	8613
12									8	3341	3619	3898	4176	4464	4733	5011	5290	5568	5846	6125	6403	6682	6960	7238	7517	7795	8074	8352
								12	8½	3550	3845	4141	4437	4733	5029	5324	5620	5916	6212	6508	6803	7099	7395	7691	7987	8282	8578	8874
									9	3758	4072	4385	4698	5011	5324	5638	5951	6264	6577	6890	7204	7517	7830	8143	8456	8770	9083	9396
13										8	3921	4222	4524	4826	5127	5429	5730	6032	6334	6635	6937	7238	7540	7842	8143	8445	8746	9048
									13	8½	4186	4486	4807	5127	5448	5768	6088	6409	6729	7050	7370	7690	8011	8331	8652	8972	9292	9613
										9	4411	4750	5090	5429	5768	6107	6447	6786	7125	7465	7804	8143	8483	8822	9161	9500	9840	10179
14											8	4547	4872	5197	5522	5846	6171	6496	6821	7146	7470	7795	8120	8445	8770	9094	9419	9744
										14	8½	4820	5177	5533	5889	6245	6601	6957	7313	7669	8025	8381	8738	9094	9450	9806	10162	10518
											9	5116	5481	5846	6212	6577	6943	7308	7673	8039	8404	8770	9135	9500	9866	10231	10597	10962
15												8	5220	5568	5916	6264	6612	6960	7308	7656	8004	8352	8700	9048	9396	9744	10092	10440
											15	8½	5546	5916	6286	6655	7025	7395	7765	8134	8504	8874	9243	9613	9983	10353	10722	11092
												9	5873	6264	6656	7047	7439	7830	8222	8613	9005	9396	9788	10179	10571	10962	11354	11745
16													8	5939	6310	6682	7053	7424	7795	8166	8538	8909	9280	9651	10022	10394	10765	11136
												16	8½	6310	6703	7099	7491	7885	8282	8677	9071	9466	9860	10254	10649	11043	11438	11832
													9	6682	7099	7517	7934	8352	8770	9187	9605	10022	10440	10858	11275	11693	12110	12528
17														8	6705	7099	7494	7888	8282	8677	9071	9466	9860	10254	10649	11043	11438	11832
													17	8½	7124	7543	7962	8381	8800	9219	9638	10057	10476	10895	11314	11733	12152	12571
														9	7543	7987	8430	8874	9318	9761	10205	10649	11093	11536	11980	12424	12867	13311
18															8	7517	7934	8352	8770	9187	9605	10022	10440	10858	11275	11693	12110	12528
														18	8½	7987	8430	8874	9318	9761	10205	10649	11093	11536	11980	12424	12867	13311
															9	8456	8926	9396	9866	10336	10805	11275	11745	12215	12685	13154	13624	14094
19																8	8373	8817	9259	9702	10142	10584	11025	11467	11909	12351	12792	13234
															19	8½	8809	9367	9835	10304	10772	11240	11709	12177	12645	13113	13582	14050
																9	9422	9918	10414	10910	11406	11902	12398	12893	13389	13885	14381	14877
20																		8	9280	9744	10208	10672	11136	11600	12064	12528	12992	13456	13920
																	20	8½	9860	10353	10846	11339	11832	12325	12818	13311	13804	14297	14790
																		9	10440	10962	11484	12006	12528	13050	13572	14094	14616	15138	15660

SIMPLIFIED SIZING — HEATING INSTITUTE L.A. 9-1-42

CHARTS A, B, B1, B2, C AND D SHOW REPRODUCTIONS OF THE CALCULATION CHARTS WHICH HAVE BEEN PREPARED TO MAKE IT POSSIBLE TO DRAW UP JOB SPECIFICATIONS FOR GRAVITY OR FORCED AIR GAS FURNACES WITHOUT RECOURSE TO INVOLVED MATHEMATICAL CALCULATIONS.

HEATING SURVEY AND CALCULATION SHEET

NAME JOHN JONES ADDRESS 1001 A STREET

SPACE TO BE HEATED HOME

TYPE OF APPLIANCE: GRAVITY FURNACE ☐ FORCED AIR FURNACE ☑

CONSTRUCTION	TYPE	CHART
EXPOSED WALLS	2H	A
CEILING AND FLOOR	2H	B
DOORS AND WINDOWS	1 H	C
CUBICAL CONTENTS - - - -	- - - - - -	- - D

PROCEDURE

STEP 1. FILL IN NAME, ADDRESS, ETC.
STEP 2. DETERMINE AND NOTE TYPE OF CONSTRUCTION.
STEP 3. DETERMINE ALL MEASUREMENTS FOR SPACE TO BE HEATED.
STEP 4. READ ALL CHARTS AND ADD BTU INPUT FIGURES.
STEP 5. RECOMMEND NEAREST LARGER SIZED FURNACE.

ROOM NO. LIVING ROOM

EXPOSED WALLS	LENGTH	CEILING HEIGHT	BTU INPUT
CHART A 1.	20'	8'	4160
CHART A 2.	14'	8'	2912
CHART A 3.			

CEILING FLOOR	LENGTH	WIDTH	BTU INPUT
CHART B	20'	14'	9800

DOORS WINDOWS	HEIGHT	WIDTH	BTU INPUT
CHART C 1.	2-4'	5'	675
CHART C 2.	2-5'	2'	270
CHART C 3.			
CHART C 4.			
CHART C 5.			
CHART C 6.			

CUBICAL CONTENTS	LGHT.	WIDTH	HGHT.	BTU INPUT
CHART D	20'	14'	8'	6496

TOTAL BTU INPUT INTO ROOM 24313

ROOM NO. BEDROOM

EXPOSED WALLS	LENGTH	CEILING HEIGHT	BTU INPUT
CHART A 1.	15'	8'	3120
CHART A 2.	10'	8'	2080
CHART A 3.			

CEILING FLOOR	LENGTH	WIDTH	BTU INPUT
CHART B	15'	10'	5250

DOORS WINDOWS	HEIGHT	WIDTH	BTU INPUT
CHART C 1.	2'6"	3'6"	473
CHART C 2.	3'	3'	486
CHART C 3.			
CHART C 4.			
CHART C 5.			
CHART C 6.			

CUBICAL CONTENTS	LGHT.	WIDTH	HGHT.	BTU INPUT
CHART D	15'	10'	8'	3480

TOTAL BTU INPUT INTO ROOM

ROOM NO. KITCHEN

EXPOSED WALLS	LENGTH	CEILING HEIGHT	BTU INPUT
CHART A 1.	12'	8'	2496
CHART A 2.	10'	8'	2080
CHART A 3.			

CEILING FLOOR	LENGTH	WIDTH	BTU INPUT
CHART B	12'	10'	4200

DOORS WINDOWS	HEIGHT	WIDTH	BTU INPUT
CHART C 1.	3'	2'6"	405
CHART C 2.	3'	3'	486
CHART C 3.			
CHART C 4.			
CHART C 5.			
CHART C 6.			

CUBICAL CONTENTS	LGHT.	WIDTH	HGHT.	BTU INPUT
CHART D	12'	10'	8'	2784

TOTAL BTU INPUT INTO ROOM 12451

ROOM NO. DINING ROOM

EXPOSED WALLS	LENGTH	CEILING HEIGHT	BTU INPUT
CHART A 1.	15'	8'	3120
CHART A 2.	10'	8'	2080
CHART A 3.			

CEILING FLOOR	LENGTH	WIDTH	BTU INPUT
CHART B	15'	10'	5250

DOORS WINDOWS	HEIGHT	WIDTH	BTU INPUT
CHART C 1.	3-1'	5'	810
CHART C 2.	4'	5'	1080
CHART C 3.			
CHART C 4.			
CHART C 5.			
CHART C 6.			

CUBICAL CONTENTS	LGHT.	WIDTH	HGHT.	BTU INPUT
CHART D	15'	10'	8'	3480

TOTAL BTU INPUT INTO ROOM 15820

SUB-TOTAL 40133

ROOM NO. BEDROOM

EXPOSED WALLS	LENGTH	CEILING HEIGHT	BTU INPUT
CHART A 1.	12'	8'	2496
CHART A 2.	10'	8'	2080
CHART A 3.			

CEILING FLOOR	LENGTH	WIDTH	BTU INPUT
CHART B	12'	10'	4200

DOORS WINDOWS	HEIGHT	WIDTH	BTU INPUT
CHART C 1.	3'	2'6"	405
CHART C 2.	3'	3'	486
CHART C 3.			
CHART C 4.			
CHART C 5.			
CHART C 6.			

CUBICAL CONTENTS	LGHT.	WIDTH	HGHT.	BTU INPUT
CHART D	12	10	8	2784

TOTAL BTU INPUT INTO ROOM 12451

SUB-TOTAL 27340

ROOM NO.

EXPOSED WALLS	LENGTH	CEILING HEIGHT	BTU INPUT
CHART A 1.			
CHART A 2.			
CHART A 3.			

CEILING FLOOR	LENGTH	WIDTH	BTU INPUT
CHART B			

DOORS WINDOWS	HEIGHT	WIDTH	BTU INPUT
CHART C 1.			
CHART C 2.			
CHART C 3.			
CHART C 4.			
CHART C 5.			
CHART C 6.			

CUBICAL CONTENTS	LGHT.	WIDTH	HGHT.	BTU INPUT
CHART D				

TOTAL BTU INPUT INTO ROOM

SUB-TOTAL

GRAND TOTAL 79924

FOR TWO-STORY HOUSES:
USE CHART B-1 FOR FLOOR LOSS—1ST FLOOR.
USE CHART B-2 FOR CEILING LOSS—2ND FLOOR.

RECOMMENDATION: SIZE _____ M. BTU.

FIRM NAME _____

SALESMAN _____ DATE _____

REMARKS _____

The "Heating Survey and Calculation Sheet" shown here is used by gas appliance salesmen in Southern California for recording room dimensions and inserting B.t.u. input requirements for a room of different sizes.

Reference to a set of six calculation charts quickly indicates the requisite B.t.u. input.

and skylights on a certain type of construction, for instance, is 1.1 B.t.u. per square foot per degree of Fahrenheit; therefore, the input factor for each square foot area of windows, doors or skylights is calculated by the following formula:

$$\text{Input Factor} = \frac{\left\{\begin{array}{c}\text{1.1 Btu per square foot} \\ \text{per degree Fahr.} \times \\ \text{40°F. Temp. Rise}\end{array}\right\}}{\text{70\% Appliance Efficiency}} \Big/ \text{83\% Duct Efficiency} = 77$$

After all the necessary input factors were derived, the mathematical calculations for all areas involved in a building, including leakage, were performed and printed on a series of six charts. These charts make it unnecessary in 99% of the cases for the person making up the job specifications for gravity or forced air gas furnaces to perform any multiplication.

The charts are used by the job estimator after all the data concerning cubical content of rooms, including walls, ceiling, floor and window areas, have been obtained and inserted on the "Heating Survey and Calculation Sheet," which heating salesmen in the area now carry as part of their standard equipment. The representative's first task upon beginning his interview with a prospective customer is to fill out five "procedure" steps which are contained in a boxed square in the upper section of the "Heating Survey and Calculation" sheet. These steps are: fill in name and address; determine and note type of construction; determine all measurements for space to be heated; read all charts and add B.t.u. input figures; recommend nearest *larger size* furnace.

In another section of the sheet he inscribes the type of construction of exposed walls, ceiling and floor, doors and windows. Reference to the table on the inside cover of his kit tells him quickly into which type, according to construction, the various parts of the building fall—1H, 2H, 3H, 4H or 7H.

B. t. u. Input Table

The table on the inside front cover of the heating kit presents the following data on B.t.u. inputs per square foot of exposed surface area for simplified method of sizing for gravity and forced air gas furnaces:

After the representative has determined the type into which the building which is to be heated falls, he next measures the exposed walls and ceilings of each room and inserts the measurements in the columns provided for that purpose on the "Heating Survey and Calculation" sheet. Having found, by reference to the type-of-construction column on the inside-front cover of his kit that the building, for instance, falls within Type 2H (most common in Southern California), he refers to Chart A—Exposed Walls, in the pocket of the kit. In the column identified as "Type 2H—Stucco, Paper, Studs" —on the chart he notes that a room which conforms to the measurements he has made (20x14 with ceiling height of 8 ft., for the purpose of this article) has a total input requirement of 7072 B.t.u. Ceiling and floor calculations for the room are made by checking their dimensions against rooms of that size on "Chart B," which discloses that a ceiling and floor in a 14x20x8 foot room in a Type 2H house requires 9800 B.t.u.

	Type	Coefficient	Input Factor
WALL CONSTRUCTION			
Windows, doors, skylights	1H	1.1 *	77
Stucco, paper, studs (exposed studs)	1H	1.1	77
Stucco, paper, studs, lath, plaster	2H	0.398	26
Stucco, paper sheathing, studs, lath and plaster	3H	0.3145	22
Wood siding, paper, studs, lath, plaster	3H	0 3145	22
Wood shingles or shakes, strips, studs, lath and plaster	3H	0.3145	22
Eight-inch brick, furred, lath and plaster	3H	0.3145	22
Brick veneer, paper sheathing, studs, lath and plaster	4H	0.2495	17
Wood siding or shingles, paper sheathing, studs, lath and plaster	4H	0.2495	17
ROOF CONSTRUCTION			
Asphalt or rigid asbestos shingles, composition, slate or tile roofing on wood sheathing and no ceiling (rafters exposed)	1H	1.1	77
Wood shingles on wood strips, no ceiling (rafters exposed)	1H	1.1	77
Wood, asphalt or rigid asbestos shingles, composition, slate or tile roofing on wood sheathing or strips with lath and plaster ceiling	2H	0.398	26
FLOOR CONSTRUCTION			
Double floor over vented space	7H	0.13	9
Floor resting on ground	7H	0.13	9

LEAKAGE

Input factors were determined by selection of a fixed 70% appliance and duct efficiency of 83%, selection of specified number of air changes per hour (four), 100% fresh air, and a fixed temperature differential (40%).

* *Glass loss determined by use of additive figure to exposed walls (Chart C).*

Charts Give B.t.u. Needs

Door and window openings are similarly measured and B.t.u. ascertained by reference to "Chart C—Doors and Windows." B.t.u. requirements for the cubical contents of the room are obtained by checking against "Chart D — Cubical Contents," which informs the salesman that a room of the dimensions under consideration requires 6496 B.t.u. Adding all the B.t.u. figures for the walls, ceiling, floor, windows - doors and the cubical content indicates the total B.t.u. input for the room.

This procedure is followed for every room in the house. For two-story dwellings, supplementary charts are provided for calculating the floor loss on the first floor and the ceiling loss on the second floor. Charts "B1 —floor" and "B2—Ceiling" are used for that purpose.

The "Heating Survey and Calculating Sheet" is designed to calculate the input requirements of six rooms, or sufficient space to take care of the normal 3-bedroom home. If a house contains more than six rooms, another sheet of the same type is used. The total B.t.u. input for each room is carried in a sub-total at the bottom of each room-column, and the grand total for the entire house at the bottom of the sheet. The recommended size of the gas furnace in B.t.u.'s, as determined through the calculations, is also inserted at the bottom of the form.

Factual Data Determined

The "Heating Survey and Calculation" sheet is designed primarily to determine factual data concerning the space to be heated. The form also has been found to have a certain sales psychology value, largely because most persons like to feel that equipment which they are purchasing has been designed especially for their own particular needs.

Equipment salesmen of the Southern California Gas Co., Southern Counties Gas Co. and appliance dealers, therefore, have been urged that no part of the sheet be neglected while a prospective customer is being interviewed. If the schedule out-

(*Concluded on page 42*)

INTERN "OLD DUSTY"

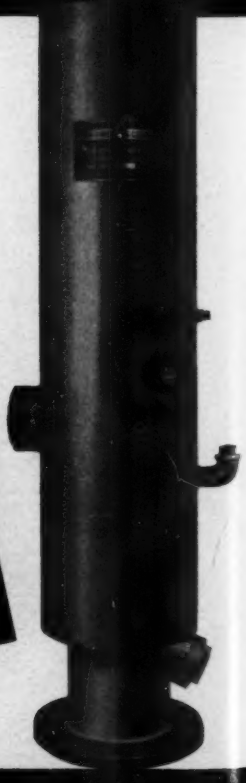
Don't let DIRTY GAS interfere with War Production

Heat treating is vital to the production of tanks, ships, shells, guns and small arms. Gas is the ideal fuel for the job—but it must be delivered in a clean, dependable flow. Blaw-Knox gas cleaners will chase "Old Dusty" —Mr. Dustan Abrasion—and assure continuous service, clean gas.

BLAW-KNOX DIVISION OF BLAW-KNOX COMPANY
2070 Farmers Bank Bldg. Pittsburgh, Pa.

Get this low-cost "K" series Gas Cleaner—now available from stock at only $95

Write for complete details on the ideal "K" series Gas Cleaner for your use. Available in two sizes and three weights for installation in front of industrial meters, at district regulator stations, small city gate stations, etc. State where to be placed, maximum gas volume MCF hour, the minimum and maximum pressure.



BLAW-KNOX GAS CLEANERS

All-Out War Effort Places The Gas Business In A New Role

By

James E. Humphreys

Director of Advertising and Publicity
The Ohio Fuel Gas Company
Columbus, Ohio

SHADES OF YESTERYEAR! When the surviving "old gas men" of a few decades back witness the wide fields covered in today's utility operations, they probably recall that the gas business was once a man's game and the women used the product — or else. We in The Ohio Fuel Gas Company probably would have scoffed at a seer three years ago had he prophesied our operations today. On the occasion of the recent anniversary of "Pearl Harbor" we published an advertisement reporting to our customers on the Company's ALL-OUT efforts in the first year of the war. It was amazing even to ourselves to see the many and drastic changes that had taken place in our own business.

There was the big job of providing gas for war industries as well as domestic and commercial customers. A book could be written on the extensive preparations and vast outlays of money to provide an adequate supply of gas and the necessary plant to deliver the gas where needed. A thorough program was set up to prevent sabotage and to deal with this threat if it succeeded in reaching us. There was the participation of gas company employees in the Utilities Repair Division of Civilian Defense. More than 85 per cent of the employees completed the standard course in American Red Cross first aid and many followed with the advanced course.

For the first time in 25 years customers were advised to conserve gas since it is a vital commodity in the war production program. We even conducted an educational campaign among our customers to inform them of the things we would ask them to do should an emergency exceed the bounds of our control. There was the matter of increased taxes, and we discovered that our Federal tax bill for 1942 would equal the cost of 232 light tanks or 6,430 jeeps or 37,646 sub-machine guns.

The War Bond campaign came in for a big share of attention. Our every-employee-a-business-builder program went out with the drying up of gas appliance merchandising. Asked by the Treasury Department to become a licensed agent for the sale of Bonds, we swung our employees over onto the selling of bonds, staging contests to enliven the activity. The Ohio Fuel Gas Company has issued over a million and a half dollars in bonds through employee subscriptions and sales to others.

Revised Employee Set-Up

With nearly one out of five male employees now serving in the armed forces, we've had to double up jobs and make numerous changes in our set-up to deal with the public. Unusually high salaries paid war workers have added to the difficulties in meeting this situation. All of these problems have presented themselves to other gas companies and are being dealt with in a manner that seems to fit the case best.

If these changes are radical departures from the business-as-usual times, certainly we have done handsprings along the lines of nutrition and feeding. Most gas companies may have stepped into such activities as related to the war, but we are told that our program includes several features which have not been generally adopted.

Cooking Schools

For years Ohio Fuel has maintained a Home Service Department with representatives in its 10 operating districts. The work of these employees consisted of home calls answering complaints, making surveys or as a follow-up on merchandise sales. Also they made school and women's group contacts. For six years Gasco Food Institutes had been conducted in some 55 of the key cities served by the Company. These Institutes were cooking schools lasting two or three days, sponsored by the local newspaper and held in school auditoriums and theaters. Two units covered the territory, each consisting of a lecturer, a manager of properties, completely equipped stage kitchen and a car and trailer for moving the equipment and personnel.

Virtually dropping the appliance merchandising program and changed conditions of dealers in other commodities who had participated in the Gasco Food Institutes caused a decision to abandon the cooking schools for the duration. The coming of automobile, tire and gasoline rationing greatly reduced opportunity for home calls. A new type of group customer contacts would be necessary to hold our place in the minds of our customers. Fortunately the opportunities which opened in this direction offered greater opportunities to serve the customer and to contribute substantially to the war effort.

Nutrition Courses

Last Spring, Miss Hulda Ungericht, our Home Service Director, gave special instruction in the Red Cross Nutrition Course to the representatives of her department and they in turn started teaching the course to Red Cross volunteers as fast as they could be qualified by the American National Red Cross. This course, consisting of 20 hours of classroom lecture and demonstration, took hold from the start in many cities. Today our Home Service Representatives are encouraged to find others qualified to teach the classes, reserving the food demonstration sections for themselves. In this way they can multiply their activities among more women.

Seeing the high degree of interest in this subject, Nutrition Centers were constructed in 40 of the larger offices. Government literature and charts, a monthly nutrition bulletin issued by our own Company and the literature of manufacturers and associations are available at these centers. In some cities Red Cross workers who have completed the Nutrition Course are assigned by the local Nutrition Chairman to operate these

LEFT: Peerless heavy duty hot plates provide for top burner cooking and coffee making in the stationary kitchen. At the far end can be seen the 8-foot Servel gas refrigerator.

RIGHT: Front view of the stationary Red Cross Kitchen located on the Company's sales floor at Columbus. Along left side are sinks and at right are utensil rack and counter space. Four large tables surrounded by chairs in the center of the room furnish accommodations for class work or even feeding space for small groups.

centers. In smaller communities the Home Service Department has instructed the office girls on assisting the public in these matters. Thousands of housewives have stopped at these Nutrition Centers to discuss their food problems and obtain literature. In many cities window displays tie in with different phases of nutrition.

Along this line it might be well to mention a new war booklet for homemakers which is being distributed through Nutrition Centers. We named it "War Ways — For Guardians of the Home Front." This booklet covers such subjects as the essentials in the daily food guide, economies in purchasing and storage of food, leftover hints, refrigerator hints, care of refrigerator, cooking to save food values, two weeks of Victory menus, Victory recipes, packing a lunch, making your range last and fuel conservation. It also describes hand laundrying, stains, care of water heaters and short cuts in home management. One page is devoted to some of the patriotic efforts in which the housewife can help—another lists help and information guides on Civilian Defense, house problems, emergencies and gas service in an air raid. This 16-page booklet printed in the nation's colors is now in its second printing—so great has been the demand for it. It is available to other gas companies at rerun prices through the organization which handled the production for us.

Through continual contact with Red Cross on nutrition our activities followed on into canteen training. Red Cross Canteen workers are the women who handle emergency feeding in times of disaster resulting from war, floods, or other causes. This course is open to those women who have completed the course in nutrition. It also consists of 20 hours of class work plus additional hours of work assignment. Seeing a great need for assistance in securing and training volunteers in this important work we set out on a most ambitious program. Since it involved many county chapters in the territory we serve, we went to the American National Red Cross at Washington for approval. Convincing them that our work would not be commercialized in any way, we received the "go ahead" to cooperate with the local chapters. This article will deal with our part in this program but readers should not gain the impression that other organizations are not swinging in with their support in the same area. Because of this, our assistance is greater in some counties than in others. In many instances our Home Service Staff are members of, or leaders in, the Red Cross Canteen committees. In others we merely contribute our support along with others.

Canteens on Wheels

In an earlier paragraph it was mentioned that two trailers and two cars were used to move the stage equipment of the Gasco Food Institutes between cities. Plans were drawn up for converting these to Red Cross Mobile Canteen Kitchens. A study was made of other such canteens. We attempted to build the maximum of cooking capacity into each unit. Plans were checked with large restaurant operators for the benefit of their suggestions.

Several months were required to process the priorities on critical materials needed and construction had to be somewhat on a "trial and error" basis. Upon completion, the Mobile Canteens were inspected by the State Director of Health and a representative of the office of State Fire Marshall. Minor changes were made to conform to their suggestions to safeguard health and prevention of accidents. A manual was prepared to instruct Red Cross workers in the specific operations of these kitchens.

Local Red Cross Canteen units regularly operate from a stationary kitchen, usually located in a lodge, church or school. Here they have the facilities for mass feedings that are not in regular full-time use. The Mobile Kitchens would be called in to supplement the capacity of local kitchens or in case those to be fed were too far from the stationary kitchen to make transportation of hot food practical. Also, these kitchens can operate entirely independent of regular gas, electric and water supplies, and it is possible that the disaster which would create the need for such feeding might put regular utility services out of commission. How much help would these units be? Their full capacity will not be known until the need arises, but restaurant people estimate that each unit is capable of handling hot food for 1500 people and possibly could serve continuously.

Awaiting the call for emergencies the Mobile Canteens cover our territory training Red Cross workers in their operation and assist in securing additional volunteers for training. Trial feedings are held at war plants, schools, hospitals and with other organizations to give the women experience in operating the kitchens. In such cases all preliminary contacts are made by Red Cross and those fed pay for their food. Also the kitchens are set up at traffic centers of the different communities and the public is invited to inspect them. Publicity heralding such events is handled by the Red Cross and the women in uniform act as hostesses on public inspections. Many women can be interested in taking the train-

ing course as a result of these inspections. Folders telling of the Canteens are passed out at trial feeding and inspections. On several occasions the Mobile Kitchens have participated in civic parades.

Pictures describe the Mobile Canteens better than words. The cooking and part of the food preparation are handled in the trailers. Serving, dishwashing, and part of the food preparation are cared for in a 14x35 foot tent which is erected over the trailer. Sidewalls on the tents and the water heating range connected to the outside of the trailer permit volunteers to work in comparative comfort even in below freezing weather. All outside equipment packs in the trailers for transportation.

The fuel used is Protayne, a commercial bottled gas. Two 100-pound tanks carried in each unit will furnish enough fuel for over 30 hours of continuous operation of the cooking, coffee and water heating ranges and the refrigerator. No place in our territory is more than an hour's ride from a replenishing supply of this gas. The electric system is either by storage battery or city current. If city current is not available inside lighting is by storage battery and the tent area is lighted by gasoline lanterns. A 100-foot extension cord is carried to reach city current if available, which also permits the use of exhaust and circulating fans and the radio. A large water tank is built into the top and front of the trailer, permitting running water both at inside and outside faucets. A 50 foot hose is carried for connecting to city water if such is available, in which case the tank is cut out. A four-gallon water cooler and paper drinking cups provide drinking water for the workers. Such a unit could not attempt to furnish drinking water to the people to be fed in an emergency.

Canteen Equipment

The cooking vessels range from small pans to 20-gallon stock pots. The main range area can be covered with griddles for this type of cooking. Coffee is made in two heavily tinned 10-gallon urns which can be carried outside for serving. Skillets, kettles, mixing bowls, slicers, cutlery, scales, measures, etc. make up the other cooking utensils. The main cooking range uses bar burners to give the best heat distribution under large cooking vessels. It has a solid cooking area of 22 inches by 7 feet, plus four star burners at the end for small batch cooking. The coffee range has two star burners and the water heating range is the same type with four burners. In case of the need for stepping up cooking capacity, dishwashing could be dispensed with through the use of paper dishes and the use of the water heating range could be applied to additional cooking. A five-foot Servel gas refrigerator provides storage for butter and cream. Bulk perishables are delivered to the point of feeding as needed in emergency feedings.

Each kitchen carries 400 sets of eating utensils consisting of plate, nesting cup and bowl in enamelware and knife, fork, teaspoon and dessert spoon in cheap silver. Through dishwashing, the number to be fed in an emergency could be multiplied. An emergency supply of linen, cleaning and sterilizing agents, coffee and other supplies are included in the supplies.

The tow car has several uses besides pulling the trailer. It is a 2-door sedan with only a single seat in front for the driver, permitting the car to become an office for the local Chairman. A folding desk and Red Cross bulletin heads are provided to facilitate her work. Built into the car is a loud-speaker system operating on either battery or city current. This can be used in directing the people to be fed, in explaining the unit to large groups or for music in case of parades. This equipment was salvaged for the former cooking school operations. Also the tow car is equipped with a folding cot and bedding to serve as a watchman's bed or an improvised ambulance should one of the volunteer workers be injured. Fire extinguishers and first aid kits are located both in the car and trailer. The manager of each unit is trained in advanced Red Cross first aid.

Nearly 200 separate items of inventory are found in each unit with a total of over 3,000 individual pieces. Storage of equipment into the trailer was planned with the idea of efficiency as well as weight distribution. Dishes are stacked in units of 25 and carried in dust-proof cloth bags. Silver is packed in units of 24 in flannel rolls to prevent rusting. All cupboards are labeled as to contents and the manager carries a master inventory list to assist workers in locating or replacing equipment and supplies.

Operation of Units

The trailer and car are painted white with the lettering "American Red Cross, Emergency Canteen Kitchen, Unit No. 1 (or 2) sponsored by The Ohio Fuel Gas Company." The Red Cross and the emergency feeding insignia of Civilian Defense appear on the equipment. The manager of each unit has had several years experience as a gas service man as well as serving as manager of the Food Institutes. Thus he is familiar with the problem as well as the territory and the Company organization in the different cities. With two service men helping, the unit can be set up for operation in a little more than 30 minutes. Sand bags are used to hold the tent when staking is not permissible.

Advance arrangements for the unit are handled by the local Home Service Representative through contact with the Red Cross. Also, she assists the local Chairman in training the worker in the use of the kitchen. All appearances of the units are under the direction of the Red Cross—never the gas company. Any publicity relative to the appearances is handled by the Red Cross, though we will assist them in preparing it.

LEFT: All of the equipment for the Mobile Canteens packs into the trailer and tow car pictured ready to roll.

RIGHT: The complete Mobile Kitchen ready to operate by Red Cross Canteen workers.

Interior of trailer kitchen looking to the rear. Main range is of special design by Peerless. Coffee range is standard heavy duty hot plate. Servel gas refrigerator is seen on left.

Enthusiastic Reception

Now that we've described the equipment of the Mobile Canteens, the reader may wonder how the Volunteer Red Cross workers and the public react to them. Modesty must be cast to the winds in telling this part of our story. The "Ohs" and "Ahs" exclaimed by the persons first seeing the units are enough to cause a glow in the cockles of any gas person's heart. The compactness, the gleaming utensils, the spotless cleanliness, the hundred - and - one conveniences captivate them immediately. In the case of public inspections the Red Cross workers show the equipment with a sense of pride that is hard to describe. Women going through the trailer ask when they can start training in this work. Both they and the workers can hardly accustom themselves to the fact that here is a Mobile Kitchen with practically every advantage of a stationary kitchen. Men who see the equipment are absorbed greatly with the mechanical side.

At the inside work counter four women can make sandwiches continuously without moving from their tracks. The running water, the built-in gas system, the dual lighting system — "Gosh," they say, "How did you think of everything?" They can hardly wait to cook in it. One day at a public inspection the wind blew the canvas of the tent in (We've provided against this happening again) upsetting a table on which was a 20-gallon aluminum stock pot. The manager hurried to examine the utensil, explaining that it had cost $35. and was irreplaceable. So impressed were the workers that we now let the value of the precious stock pot be known to them and they treat all equipment with greater care. And do they love to polish up that stock pot at the conclusion of a feeding!

Most gracious letters from local Red Cross officers come into our Columbus Office after one of the units has made an appearance in a territory. Call our investment in these Mobile Kitchens "advertising" or any other name, but we have held rigidly to the principle of commercializing them in no way whatsoever. Even so, we consider them one of the best investments ever made with our promotional and advertising dollar.

Emergency Feeding Kitchen

Our Columbus office has a large sales floor, the capacity of which is no longer needed for the display of gas appliances. An area over 30 feet square was enclosed with wallboard and this was converted into a training and emergency feeding kitchen. This kitchen has been named the number one emergency feeding kitchen for the county and all Canteen workers have experienced one or more trial feedings in its operation. This kitchen is equipped with two heavy duty 6 burner hot plates for top burner cooking, a battery type oven, a two burner range for the coffee urns and an 8-foot gas refrigerator. Cabinets, sinks, tables and a utensil rack complete heavy equipment. It carries the same cooking utensils and 400 sets of dishes and silver as the Mobile Kitchens. Food from this kitchen is carried to the location of trial feedings, blood bank depots, etc. in the Red Cross station wagon. This kitchen is in use nearly every day for classes or feedings. It is not uncommon for two or more groups to make use of it in a single day. The Franklin County Chapter of Red Cross stores certain food supplies in this kitchen for quick feeding.

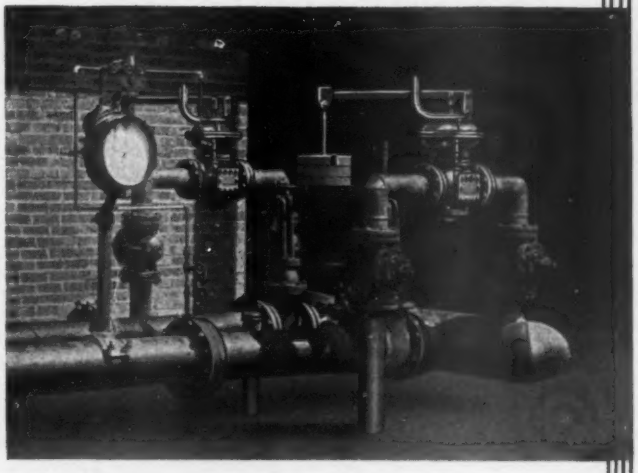
Cooperation With Servel

Just as we began to feel that our program along this line was complete, Servel came out with their Nutrition in Industry program featuring "Eat to Beat the Devil." We seized this as another opportunity to serve the war effort as well as maintain customer contacts. This program is gaining momentum over our entire territory and we are finding that many industries which have investigated different nutrition programs are now preferring the Servel plan. In such cities where trained Red Cross workers are available the "Eat to Beat the Devil" program sometimes is introduced to the war workers by the Red Cross serving them a "Victory Lunch" from the Mobile Canteen. This adds drama to a program that can be most helpful to every war industry. We have found County Nutrition Councils most receptive of the Servel program.

Taking our own medicine, we are introducing the "Eat to Beat the Devil" program to our own gas company employees. Meetings are being held in each of the 10 operating dis-

(Concluded on page 42)

GAS MEETS THE Challenge!



In Industry, as well as in every other phase of America's struggle, to keep America safe for Americans, gas is playing a leading role. Regardless of whether it is an unusual requirement of accurate control in heat treating or some other industrial need, REYNOLDS has the answer to Gas Control Requirements.

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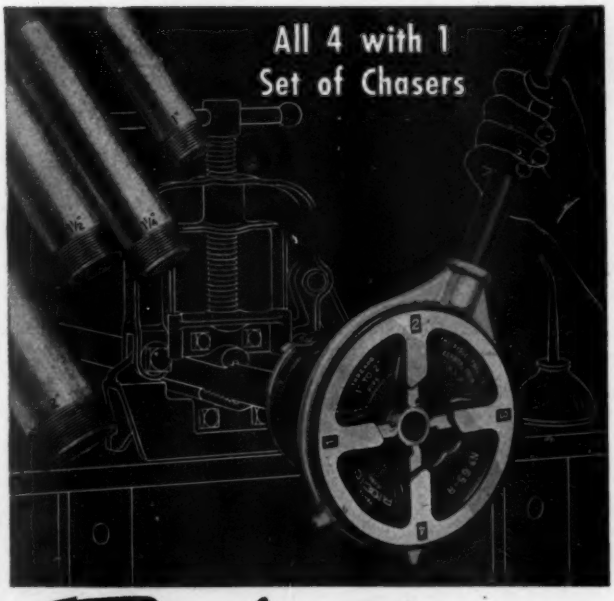

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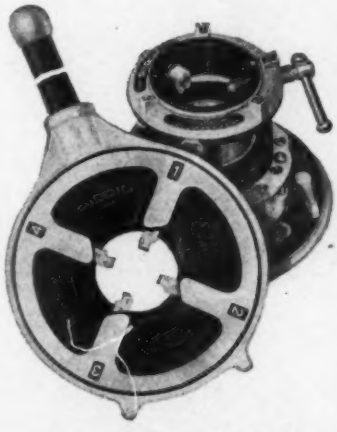

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RECENT COURT DECISIONS
Affecting Gas Utilities

How to Determine Validity of Gas Corporation's Contract

By
Leo T. Parker
Attorney at Law
Cincinnati, Ohio

THE CHANCES of legal controversies involving gas corporations may be materially minimized if company officials understand elementary legal rights and liabilities, as based upon modern higher court decisions. Obviously, a dependable method of acquiring accurate legal information on this subject is reading in these pages the cause and outcome of law suits in which other gas corporation officials have been involved. Another effective antidote to avoidance of law suits is acquiring elementary knowledge of contract law. This is so because a great majority of legal differences involving gas corporations directly or indirectly involve contracts. Therefore, first, we shall review interesting higher court cases relating to contract law.

Legally, a valid contract is an agreement between two or more parties, firms, or corporations by which each is expressly or impliedly obligated to do *something*, not prohibited by law, within a predetermined period. Ordinary valid contracts need not be in writing, excepting contracts that relate to real property, suretyship and a few others that are required by valid laws to be in writing.

An "expressed" contract is one where the exact terms of the agreement are understood by both contracting parties, and an "implied" contract is one where the law *presumes a promise* on the part of one party or both parties to the contract.

Obviously, an invalid or void contract may not be enforced by either party and, therefore, since litigation of a contract of this nature always is unprofitable, it is important that readers shall have a dependable rule which distinguishes valid and invalid contracts. The higher courts have laid down the law that a contract is valid and enforceable if: (1) one party submitted an offer which the other party *unconditionally* accepted in detail; (2) neither party deceived, misrepresented, or exerted unlawful influence or force with respect to the other party to induce making the contract; (3) both parties agreed absolutely and positively to perform one or more *definite* acts; (4) both parties were of legal age and of sound mind when the contract was made; (5) both parties had proper and legal authority to make the contract; and (6) the objects of the contract are lawful, not against public policy, and not deceptive.

Also, the law is well settled that either party may legally cancel any contract obtained by the other as a result of direct or indirect fraud, misrepresentation, coercion, undue influence, duress, threats, or where the contract is made without proper authority of the corporation's employee, or while the latter is mentally deficient, intoxicated, under influence of drugs, or under legal age.

Moreover, there are certain kinds of contracts which are always void, such as those against public policy, prohibited by a law, tending to effect immorality or having an illegal object. The distinction between "void" and "voidable" contracts is that with respect to void contracts neither party may compel the other to fulfill his obligations, whereas with respect to voidable contracts the complaining party may use his pleasure in either declaring the contract void or he may require the other party to fulfill his obligations.

Acceptance Is Important

Briefly, the rule is that one party cannot make an offer and the other party accept it with restrictions. The one to whom the offer was made must accept the *exact* offer, or no valid contract exists. Both parties must be fair and "above the board" and not deceive the other party. In fact the courts hold that if one party submits a question and the other party knowing the answer, remains silent because he believes expressing the truth may prevent making the contract, such silence is deception which results in an invalid contract. Of course, use of threats or force invalidates a contract.

Another important point of law is that both parties must agree to perform a positive act within a *definite* period of time. For illustration, if a gas corporation becomes involved in an agreement by which its officials agree to pay a stipulated sum each month as rental for a building, the contract is invalid if the contract fails to state that the property owner agrees to accept the specified amount each month as rental. In other words, the exact details and obligations of both parties must be included in a contract. In one case, for example, the court held a contract void which provided that a gas corporation agreed to purchase from a contractor certain supplies at a stated price, but without specifying the quantity of the supplies to be purchased within a definite period.

Personal Liability

As previously explained, both parties to a valid contract must be of legal age and have legal authority to make the contract. In fact it is important to know that a gas corporation official or other employee may

be *personally* liable on a contract, although the body of the contract contains the gas corporation's name, and the official had authority to make the contract, providing the signature indicates that the official *intended* to be personally bound. In other words, although it was originally intended to obligate the gas corporation, yet an official may be personally liable on the contract if it appears from reference to the formulation of the contract that the official is personally liable.

For illustration, in a leading case (129 F. 350) it was disclosed that a contract contained the corporation's name, and was intended to bind the corporation. However, an official signed his own name to the contract. Suit was filed against the official to recover for the corporation's breach of the contract, although the body of the contract indicated that the corporation was solely obligated.

Since the official had signed his name without specifying that he was an employee of the corporation and that he was acting as an agent of the corporation, the court held him personally responsible.

In another leading higher court case (101 Pa. 311) an official exceeded the authority given by his employer and signed a contract. The court promptly held the official personally liable, and said:

"The reason why an agent is liable in damages to the person with whom he contracts when he exceeds his authority, is that the party dealing with him is deprived of any remedy upon the contract against the principal."

In order that readers may clearly understand how gas corporation officials, executives, and employees may avoid personal liability on contracts made for the corporation, it is advisable to explain the legal rule, as follows: (1) the name of the corporation must appear in the contract; (2) the word "by" or "per" should precede the official's signature; (3) the word "agent" or "manager" or other official title should follow his signature; (4) and the corporation's name should precede the official's signature, as: "The Sun Gas Corporation, by Joseph White, Manager."

Validity of Signature

The law of signatures is interesting. Contrary to the opinion of a majority of readers, modern higher courts hold that any form of a signature such as those made with a rubber-stamp, pencil, typewriter, symbols, initials, and the like, may be valid and result in an enforceable contract.

For example, in the leading case of Mayers v. McRimmon, 53 S. E. 447, the higher court held that an employee could bind his employer to a contract simply by signing the latter's name with a rubber-stamp. This court said:

"Where the name required has been so placed by one having authority to do it and with *intent* to endorse the instrument, the authorities hold that this is a valid endorsement."

Also, the same law is effective where a gas corporation official affixes his or the corporation's signature with a typewriter when intending to make a valid contract. See (195 Pac. 316.) And, again, if a gas corporation official or employee signs a contract using only initials, the contract is valid if the corporation officials intended to be bound when the signature was affixed.

Avoid Deception

The modern higher courts are in accord with the law that all parties to a contract should avoid *all* forms of deception. Otherwise the contract will be held void. Moreover, gas corporation officials, executives, and em-

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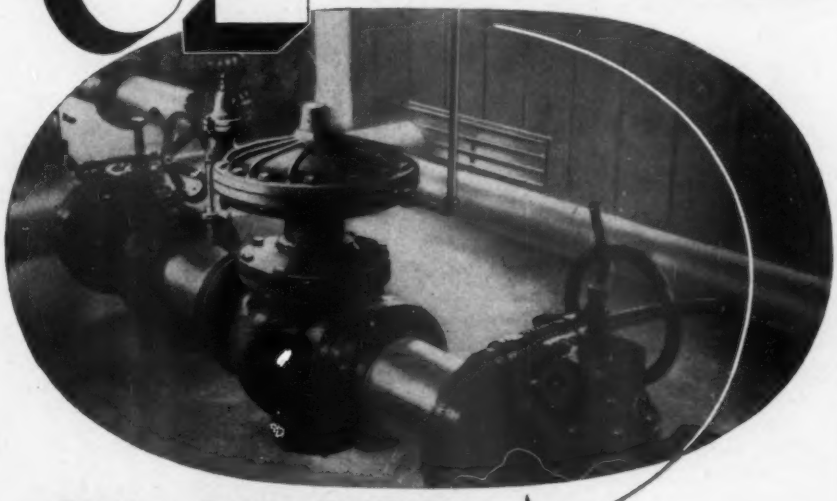

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ployees may be held personally liable for acts performed, statements made, and contracts made under conditions as follows: (1) if he knowingly made a false representation of his authority with intent to deceive a person; (2) if he performed unlawful acts with or without authority of his employer; (3) if he performed an act believing he had authority, but actually had none; (4) if he performed an act or made an agreement outside his scope of authority; and (5) where he impliedly or expressly assumed an obligation in a contract for his employer.

Obviously, the law as explained in these few words covers a great area. But, nevertheless, under all circumstances, these rules of law are applicable to all forms, styles, and classifications of gas corporation officials and employees contracts. The importance of these rules is: Take sufficient time, effort and energy to *know* this *simplified* law and, thereby, avoid future inconvenience, expense and undesirable legal controversies.

Cancellation of Contract

If a contract is valid, the question often arises: When and under what circumstances may the other contracting party cancel it?

Simplifying the law on this subject we may state that it is well established law that *all* parties to a valid contract are *bound* to fulfill the *precise* terms of the agreement, and if one party fails in this respect he performs an illegal act which entitles the other party to do either of these three things: (1) he may refuse to continue to perform his obligations and sue the other party for damages and profits in an amount equal to his financial loss resulting from the breach; (2) or, he may file suit and compel the other party to fulfill the exact terms of the agreement; (3) or, the parties may mutually agree to cancel the contract or make a supplementary contract.

Of course, a considerable number of litigations have arisen over the question: When and under what circumstances does a gas corporation breach a contract?

Generally speaking, a legal breach of a contract is *any* act in violation or contradiction to the terms of the agreement. It is important to know that neither party is entitled to recover damages based upon a breached contract, unless the testimony clearly indicates that actually a breach occurred.

For illustration, the mere fact that a party states that he *intends* to breach a contract, is not sufficient justification for the other to recover damages, unless a breach *actually* occurs.

For example, Clark v. Miller, 122 So. 475, it was disclosed that a disagreement became apparent between the contracting parties. Suit was instituted by one of the contracting parties on the contention that certain acts and statements of the other party *indicated* that he *intended* breaching the contract. The court promptly held that a contracting party is not liable for assertions of this nature because no breach is made until he fails to fulfill his obligations. This court said:

"The mere assertion of a party to a contract that he will be unable, or will refuse to perform his contract is not sufficient to constitute a breach. There must be a distinct, unequivocable, and absolute refusal to perform, treated and acted upon as such by the other party to the contract. A mere assertion of inability to go on with the contract is not a repudiation of the contract."

Failure to Read Contract

As above explained, any person who signs a valid contract is liable in damages for failure to fulfill the assumed obligations, unless it is shown that the other party to the contract practiced fraud or misrepresented facts for the purpose of inducing signing or making of the contract. And this rule of law ordinarily is applicable with respect to persons who sign contracts without reading the same. Therefore, neither contracting party may avoid liability for breaching a valid contract on the grounds that he did not understand his legal obligations, or that he failed to read the contract.

For illustration, in the late and leading case of Sharpless, 155 Atl. 247, it was disclosed that an official signed a valid contract, and later attempted to avoid liability and cancel it because he testified that he did not read it, and therefore was not fully obligated since he did not realize the obligation.

Notwithstanding this argument the higher court held the corporation bound to perform all obligations assumed under the contract, and said:

"If one can read his contract, his failure to do so is such gross negligence that it will estop him from escaping its obligations, unless he has been dissuaded from reading it by some trick or artifice practiced by the opposite party. If he cannot read it, it is as much his duty to procure some reliable person to read and explain it to him, before he signs it, as it would be not to read it before he signed it if he were able to do so; and his failure to obtain a reading and explanation of it is such gross negligence as will estop him from avoiding it on the ground that he was ignorant of its contents."

Law of Fixtures

Let us discuss a phase of law indirectly related to contracts between gas corporations and others. Very frequently a gas corporation may lease a building or space and during the period of the occupancy it may install various and different kinds of equipment and devices. After expiration of the lease contract the gas corporation may decide to remove from the building certain of the above mentioned items only to discover that the landlord objects.

Now, gas corporation officials should be able, with dependability, to decide *exactly* what kind of equipment and devices may be legally removed from a building intended to be vacated.

Generally speaking, a corporation, or leasee, which owns personal property or chattels may remove same from a leased building or grounds providing such equipment is *not permanently* attached to the building or grounds. Therefore, when determining whether an item is a "trade fixture" three things must be considered, namely: First, the method of annexation to the building; second, adaptation of the building to which it is connected; and third, intention of the parties to make the article a permanent part or addition to the building.

For instance, in the late and leading case of Blanchard, 50 F. (2d) 737, the higher court said:

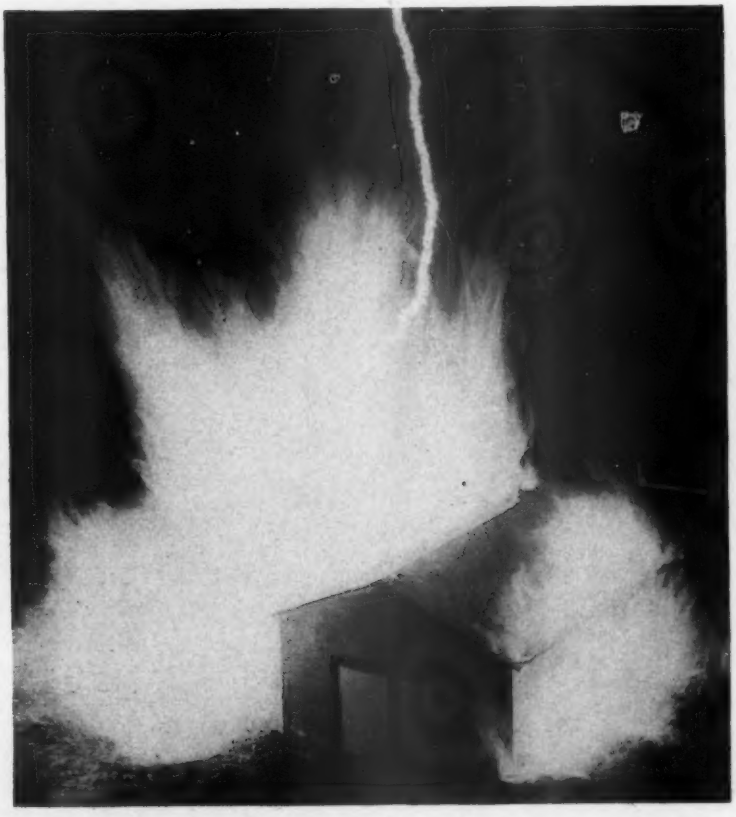
"A tenant may remove from the rented premises, any time during the continuance of his term, anything affixed thereto for purposes of trade, manufacture, or ornament, if the removal can be effected without injury to the premises. . . ."

In other words, if equipment is installed in a building and is *not* adapted to be removed and installed in another building, the equipment always is a trade fixture and *cannot* legally be removed. The same law is applicable to equipment which is installed in a building in such a manner that its removal necessitates permanent damage to the building.

On the other hand, where a device is installed in a building without any intention of the gas corporation officials of making it a *permanent* accession to the building and its removal will *not* permanently damage the premises, such equipment may be

(Continued on page 42)

"Umbrella" Shields War Plants From Lightning



UNPROTECTED MODEL SET ON FIRE BY LIGHTNING—Lightning striking a war plant handling explosive or inflammable material could cause a disaster similar to the laboratory blaze shown above. Man-made lightning, created in a surge generator which stores electricity and then releases it in a single space-leaping arc, strikes the model which contained gasoline. This was part of a demonstration of the wire "umbrella", devised by Dr. Gilbert D. McCann, of the Westinghouse Electric & Manufacturing Company, to protect ordnance plants and oil storage depots.

A wire "umbrella" to shield vital explosives plants and oil storage centers from lightning has been developed by Dr. Gilbert D. McCann, Westinghouse Electric & Manufacturing Company engineer. It is already being used by some war industries and one huge ordnance plant. Using a minimum of strategic materials, the shield easily deflects lightning driving earthward at more than 11 million miles a minute.

The shield consists simply of a steel wire strung above the building to be protected and anchored on tall wood poles at each end. The wire is then connected to steel rods buried in the ground.

This method saves copper for other war uses. Previously explosives plants or oil depots were guarded by lightning rods which required about 250 pounds of copper attached to the building and buried in the surrounding ground. An umbrella for the same building can be erected with only 60 pounds of steel and two wood poles. With the new design danger of lightning leaping to metal sections of the building and causing sparks has been eliminated.

Another lightning protection plan suggested by Dr. McCann surrounds the building with six poles 10 feet higher than the roof. Steel wires extending from the top of each pole attract lightning from the area above the structure so that an invisible lightning-proof "blanket" is suspended over the roof. Thunderbolts are drawn to the steel tips of the poles and thence to the ground.

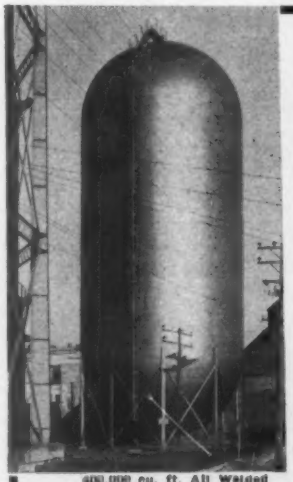
Removal of Dust From Gas

Blaw-Knox Company, Pittsburgh, Pa., has issued a new 15 page bulletin (No. 1869) containing valuable suggestions for the elimination of dust from gas, lowering gas maintenance and transport costs, effective methods of reducing service complaints, and improving public relations.

Copiously illustrated, and designed to save the valuable reading time of busy engineers and superintendents, this new booklet on Blaw-Knox Gas Cleaners also includes important installation information, vital essentials of gas cleaners, and graphically pictures the action of dust in pipe lines and means to effectively combat it. Copy on request.

Norwalk Valve Company In New Quarters

To take care of the increased production of their pressure controllers, check and back pressure valves, regulators and other products for gas control, Norwalk Valve Co. of South Norwalk, Connecticut, have moved their plant and office to 85 Spring Street in the same city.



400,000 cu. ft. All Welded Pressure Tank

if in the market for a gas holder, now or later, discuss your requirements with

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War Production Board

Water Heater Output Curbed

Gas fired and oil burning water heaters were added Dec. 21st, to the list of products which will be manufactured next year only for use in war housing or other war projects by limitation orders restricting production and limiting the amounts of metals and metal alloys that may be obtained by the industry in 1943.

Production of metal tank jackets and metal tank supports is suspended and the installation of metal tank jackets is prohibited with certain minor exceptions.

Civilian needs for replacements of gas fired water heaters in 1943 and thereafter must come out of existing stocks. Necessary replacements may still be made for some time in the future, however, since inventories of finished equipment are comparatively large at present.

Officials of the Plumbing and Heating Division suggest caution on the part of civilian consumers in replacement of their gas fired water heating systems. Coal heaters should be substituted, they advise, because of the present critical situation in the production and consumption of gas for household purposes.

Two New Orders

Two new limitation orders were issued. L-185 deals with gas-fired and oil-fired water heaters while L-199 prohibits manufacture and installation of metal tank supports and provides a simplification schedule to govern the manufacture of black iron and galvanized iron range boilers and expansion tanks.

Following is a brief summary of the principal provisions of L-185:

1. Prohibits manufacture of gas-fired and oil-fired water heaters except for war housing.
2. Restricts manufacture of solar water heaters.
3. Restricts the amount of metal used in the production of coal-fired water heaters to the amount of metal used in the corresponding calendar quarter of 1941.
4. Restricts the amount of metal used in the production of indirect water heaters to 50 per cent of the amount of metal used in the corresponding calendar quarter of 1941.
5. Prohibits the manufacture of metal jackets for all direct-fired and indirect domestic water heaters with two minor exceptions.

Copper Use Banned

6. Prohibits the use of copper or copper base alloy in the manufacture of direct fired and indirect domestic water heaters except for controls and safety devices.
7. Permits the use of copper in making repairs to existing direct fired and indirect water heaters in conformity with the restrictions prescribed in Conservation Order M-9-c as amended. Return of all replaced copper scrap to scrap dealers is required under provisions of L-185.
8. Restrictions enumerated in items 1, 2, 3 and 4 above do not apply to the manufacture of water heaters for Army, Navy, Coast Guard, War Shipping Administration or the Maritime Commission.
9. Copper or copper base alloy is permitted in the manufacture of water heaters produced under contract for use in laundry, bakery, or hospital projects or overseas services of the Army, Navy, Coast Guard, War Shipping Administration or the Maritime Commission and also when the water heaters are a part of the equipment of aircraft and vessels other than pleasure craft.
10. Provisions for the manufacture of repair and replacement parts, restricting the use of metal in any quarter to not more than the amount of metal used in such production in the corresponding quarter of 1941.

Gas and Electric Service

Restrictions on the construction of utility lines to furnish gas or electric service to domestic ranges are relaxed in Supplementary Preference Rating Order P-46-b as amended December 16th by the Director General for Operations.

Previously if the owner of a gas range moved into a house wired for an electric range, or if the owner of an electric range moved into a house piped for gas, it was necessary for the owner to acquire the type of range that would operate on the service already brought to the house.

This was changed to permit a utility to bring gas or electric service to the house to serve either a gas or electric range, provided the dwelling is not already equipped with a range of any kind. This is allowed, however, only when a person moving from one house to another already owns a range which he is taking with him.

Provision also is made for gas or electric service even where the applicant had not used a range previously, if the dwelling is not equipped with a range of any kind and if complete facilities for service to a gas or electric range have not previously been installed.

In either case, there is a limit on the amount of critical material which may be used. In the case of an electric range, not more than 15 pounds of copper may be used; in the case of a gas range, the connection may not require more than 75 feet of 1¼-inch steel pipe or its equivalent in other sizes of pipe.

Light Oil in East for Gas Manufacture

Forty-six major gas manufacturing companies along the eastern seaboard will be ordered to make their gas with light oil instead of heavy oil by Jan. 20, it has been announced by the Petroleum Administration for War.

The change is another result of the shortage in heavy oil, which is required by the Army and Navy and war production factories.

Experiments undertaken in the last few months have proved the feasibility of using a low-grade type of gasoline in gas manufacture, obtained as a by-product in the making of high octane gasoline for aviation. The low-grade variety, known as straight-run gasoline or forty-octane gasoline, may also be used eventually by the gas utilities.

The change from one oil to the other does not entail any engineering difficulties, but the light oil, called gas or distillate oil, costs from three to four cents more a gallon. To manufacture gas from it costs from four to five cents more a 1,000 cubic feet of gas, since there is an additional loss in by-products, obtainable from heavy oil, which up to now they have been able to sell.

The forty-six gas companies which will be affected by the order represent a majority of the gas utilities in District 1, comprising the eastern seaboard states.

It is understood that the order will permit the companies to appeal and that those which make gas mostly for war production factories or for the Army and Navy may be permitted to go on using the cheaper heavy oil.

Gas Main Conditioning

By
M. N. Jensen
Supt. Wisconsin Gas and Electric Company
Kenosha, Wis.

THIS SUBJECT will cover the treatment of cast-iron, low pressure mains with "Carboseal" anti-leak to reduce the leakage at hemp-lead joints. Other conditioning of mains is attended to by us in a routine manner, which is standard with everyone in the industry to a more or less extent.

For a number of years the local water gas plant was shut down, and all gas subsequently delivered was coke oven gas from our plant in another locality ten miles away. This gas being delivered locally under high pressure had been dehydrated at the manufacturing plant and had further dehydrated in transmission. The result was the continual action of drying up of the gas distribution system, with resultant increase in leakage at main joints.

Cause and Cure of Leaks

At first it was believed that these joints leaked due to poor joint construction and to ground vibration. Numerous joints were then recaulked, and in that caulking operation the lead would readily drive back, thus raising the erroneous belief that such a condition was the result of poor original caulking. However, a few years afterwards these joints leaked again. These were then excavated through pavement and repaired by the application of "No-Leak" clamps to make permanent repairs. This, naturally, was an expensive undertaking.

During the years 1938 and 1939 we began to investigate the possibility of application of "Carboseal" anti-leak liquid. This is a commercially available liquid made by Carbide and Carbon Chemicals Corporation and was offered to the industry in December, 1935.

"Carboseal" anti-leak is a clear mobile liquid of extremely low volatility and is non-flammable. Its purpose is to swell the fibers of the hemp in the joints by entering and swelling each individual cell or fiber of hemp.

Method of Application

Tests were made originally by excavating and cutting out of an existing main a known leaking 4-inch main joint and cutting out a cross-section of the joint. The hemp in this joint was found to be extremely dry, although the joint construction and caulking appeared perfect. This hemp was treated with "Carboseal" anti-leak, according to directions, and the hemp found to have swelled by capillary action to such an extent that it required extreme pressure to again join the cross-cut section to its original location.

Following that, a quantity of the liquid was ordered to be installed in a distribution section known to be leaking and having previously been metered. This was to be installed by the gravity flow method. This test was not entirely successful due to the fact that practically no recovery of the liquid was made in low spots, indicating there was a dam up of the liquid due to dust, scale, etc., in the main. However, the leakage was reduced to a satisfactory minimum.

A number of studies were then made of other utility practices—those who had adopted the application of this anti-leak liquid. Accepting the best of these practices to apply in a conservative manner, we proceeded with our program in the spring of 1940. We adopted the hose insertion method of application rather than the gravity flow method due to the flat surface of our community.

Equipment Used

For about $300, we built up a portable treatment plant, consisting of pressure and liquid tank, holder for drum of anti-leak liquid, drum of propane gas, and necessary water supply hoses, reels, gauges, and steel tapes, all mounted compactly on a light four-wheel trailer readily towable by any light truck.

Propane gas was elected as a motive power for transferring the "Carboseal" liquid through hoses into

REED'S 4 WHEEL
Razor Blade Pipe Cutters

IDEAL FOR ANY TRENCH OR OTHER CLOSE QUARTER JOBS

$5.46 F. O. B. ERIE

Capacity
½" to 2"
Weight 5 lbs.

The REED FOUR WHEEL Cutter operates with a short back and forth motion through only one-third of a circle. Each of the four wheels exerts the same pressure on the pipe, and all 4 therefore cut evenly and completely through the pipe at the same time.

Equipped with Reed special alloy RAZOR BLADE Wheels, which cut with remarkable ease, leave little burr, and have a long life of useful service.

A sample cutter for test and trial may be ordered on memorandum invoice, to be paid for if retained or returned for credit if unsatisfactory. Try it once, and you will use no other.

REED MFG. COMPANY
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the mains. Taps of 1¼-inch size are made in the mains for the insertion of the hoses. The hoses are inserted by means of steel tape fastened at 2-foot intervals to the hose. The hose is then inserted through the tap hole and the anti-leak sprayed by measured quantity as the hose is withdrawn.

The distance treated is approximately 65 feet (one way) in the case of 4-inch mains and 100 feet in the case of 6-inch and larger mains. The treatment provides approximately 3 gallons per 100 feet of 4-inch, 4 gallons for 100 feet of 6-inch, 5 gallons for 100 feet of 8-inch, and 7 gallons for 100 feet of 12-inch mains. These quantities are greater than those recommended but are prompted by our experience. Even larger quantities are injected in down-grade mains to provide gravity flow to the drips. Any surplus is then recovered and used again elsewhere. Pressures on the hoses to move the anti-leak are approximately forty pounds per square inch.

To date, the extent of our progress has been as follows:

4" Mains .....20,000 feet
6" Mains .....10,000 feet
8, 10 and 12" Mains. 5,000 feet

Our conservative policy on leak repairs and "Carboseal" anti-leak application is as follows:

The treatment is given all bell and spigot lead joint mains ahead of pavement. Wherever a leak or a series of leaks are found, the one leak or major leak location is determined and excavated. Actual repairs are then made to the leak regardless of nature. The main is then treated each way for as great a distance as can be reached by the hose method of application, regardless of condition of the cast-iron main. No further attempt is made to repair minor associated leaks within the distance treated, pending results of its application.

Results Obtained

A recheck was recently made of the treated mains to determine actual results. These mains were in areas where it was known that associated leaks, in addition to those repaired, were definitely in existence at the time of the anti-leak application. On 4,000 feet of treated main in such areas, 65 previously recorded leaks were definitely sealed, and no other leaks were in evidence. On several thousand feet of treated mains in such areas, where previously leaks were located, a number of such leaks were found to be still in existence. These were excavated and were found to be of such nature that the "Carboseal" anti-leak treatment could not have been expected to seal the leakage. These were corroded or porous services, unrecorded leaking curb services, or mechanically injured main joints. Such joints were moist on the outside with the anti-leak liquid, indicating that it had penetrated the hemp but that settlement or other causes had disturbed the lead ring sufficiently to cause leakage.

We are satisfied that this method of main treatment is effective and the program, though cautiously engaged in, can be continued with ever-mounting beneficial results.

Presented at the Distribution Conference of the Gas Section of Wisconsin Utilities Ass'n.

WANTED

Gas Holders, Pumps, Condensers, Coolers, Tanks, Boilers, Buildings, Pipe, etc.

Jos. Greenspon's Son Pipe Corp.
National Stock Yards (St. Clair County) Illinois

All sizes up to 3,400 cu. ft. capacity

Meters
Diaphragms
Repairs
Provers
Pumps
Calorimeters
Wet Meters
Gauges
Apparatus

METER REPAIR PARTS

FOR

ALL MAKES — ALL SIZES OF METERS

LARGEST GAS COMPANIES NOW USING OUR PARTS

SEND FOR OUR CIRCULAR ON METER REPAIR PARTS

SAMPLES AND PRICES GLADLY SENT

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PLAINFIELD, NEW JERSEY

CRUSE-KEMPER COMPANY

STEEL PLATE CONSTRUCTION

AMBLER, PA.

GAS HOLDERS

HOLDER INSPECTION

RIVETED OR WELDED FABRICATION & ERECTION

TANKS, BINS, FLUES PURIFIERS, WELDINGS

GAS PLANT EQUIPMENT

UGI REFINERY GAS REFORMING PROCESS
UGI NATURAL GAS REFORMING PROCESS
UGI HEAVY OIL PROCESS

GAS DISTRIBUTION

PIPE LINE CONSTRUCTION

THE U.G.I. CONTRACTING COMPANY

A DIVISION OF

UNITED ENGINEERS & CONSTRUCTORS INC

NEW YORK PHILADELPHIA CHICAGO

MAXIMUM RETURN TO CLIENT PER DOLLAR EXPENDED

Michigan Consolidated Gas Company Selectees Club Puts on a Tea Party

Guests of the Selectees Club of the Michigan Consolidated Gas Company at the party given for the families of employees who are now in Service

Gas Company Honor Roll of employees in the Service, members of whose families were entertained by the Selectees Club of the Michigan Consolidated Gas Company, Detroit.

OF ALL the employee social activities carried on through cooperation of the Michigan Consolidated Gas Company, Detroit, Mich., probably the one that has the most popular appeal is the doings of the Selectee Club, organized and operated by the girl employees, although practically everybody takes some part in helping it along.

This Selectee Club was started in July, 1940, by a few girls getting together to do something for the 38 gas company employees then in service. The club has grown as an increasing number of gas company employees joined the armed forces and now every month the 184 men and one woman who are scattered around the world receive a package containing much appreciated things that are hard to get where they may be located. These girls are maintaining a line of communication with old friends and associates in the fighting forces.

Along the first of November the girls who make up the Selectee Club decided it would be nice to entertain the mothers, wives, sisters and sweethearts of our men who had left the company to join the armed forces. The time was set for the afternoon of December 5th and when the members of this organization put their hearts into a project they are sure to come through with something fine and big.

One hundred and thirty women responded to invitations and met for tea in the specially decorated gas company auditorium, which turned out to be one of the outstanding social events in gas company history.

Upon arrival each guest was given a corsage, to which was attached a card showing the guests' name, for ready identification by others. The party opened by singing the National Anthem, with two little girls, daughters of gas company employees, posting the colors on the stage. Miss Ethel Bukart, president of the Selectee Club, gave an address of welcome to the ladies, Mr. Fink, Assistant General Manager, spoke briefly on behalf of the company, with appropriate piano and vocal solos following. At the close of the program refreshments were served and the ladies were given an opportunity to get acquainted.

It has been said that it is hardest for those who only watch and wait, and it is activities like this that help to keep up the spirit of those on the Home Front.

SUPERIOR GAS METERS

For Sound Values and Continuous Operating Economy

Meters for Domestic and Industrial Use. All Sizes 5B to 60C.
Wet Test and Demonstration Meters — Diaphragms —
Service Cleaners — Provers — Meter Repairs

Write for details and quotations

SUPERIOR METER COMPANY, INC.
167 41st Street ***Brooklyn, N. Y.***

Book Reviews

War Gases, by Morris B. Jacobs, Ph.D. Interscience Publishers, Inc., 215 Fourth Avenue, New York, N. Y. 1942. 193 pages. Price $3.00.

This book is intended to cover the essential chemical features of protection against the war gases. It does so in a concise, specific and thorough manner.

Detection, identification and decontamination are the general phases of the subject which are treated.

The author states that the aim of the book is to present these subjects in a way most useful to the gas identification officer, the war gas chemist, the decontamination officer and the health officer. In addition it should be of value to air raid wardens and similar civilian defense officials.

The main subjects covered are: Classification of Chemical Agents; the Physical Characteristics and Physiological Response of the War Gases; Effect of War Gases on Materials, Water, Food; Sampling; Scheme of Analysis; Detection and Determination of Arsenic; Confirmatory Tests; Decontamination.

Electrical Carbonization of Coal by H. Stevens, 32 Ehrman Avenue, Cincinnati, Ohio. 24 pages, 8½ x 11.

This is a bibliography of the literature which appeared between 1900 and 1940, on the use of electricity for the carbonization of coal. References are given in chronological order and include many from foreign countries. Patent and author indexes are appended. Pertinent laboratory studies have also been included.

The Chemical Formulary, Volume V, edited by H. Bennett (F.A.I.C.). Chemical Publishing Co., Inc., Brooklyn, N. Y. 694 pages. Price $6.00.

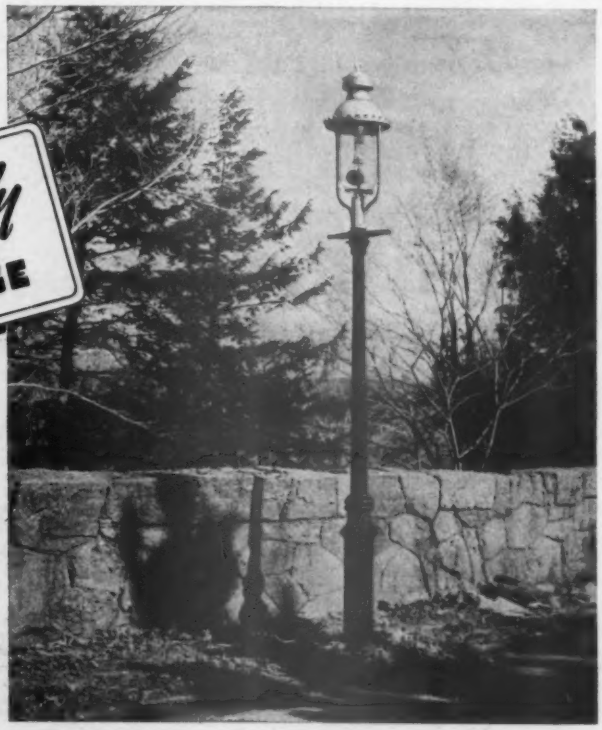
This book contains thousands of latest tested formulae from every important industry. Theory is not discussed. The information given is intended for practical use in the manufacture of marketable products or in the operation or maintenance of a plant.

The formulae are new, and there is no repetition of material appearing in previous volumes.

The book is divided into the following sections: *I. Introduction. II. Adhesives. III. Beverages. IV. Cosmetics and Drugs. V. Emulsions and Dispersions. VI. Farm and Garden Specialties. VII. Food. VIII. Inks. IX. Leather, Skins, Furs. X. Lubricants, Oils, Fats. XI. Materials of Construction. XII. Metals and Metal Treatment. XIII. Paints, Enamels, Varnishes, Lacquers. XIV. Paper. XV. Photography. XVI. Polishes. XVIII. Rubber, Resins, Plastics, Waxes. XIX. Soaps, Cleaners. XX. Textiles, Fibres. XXI Miscellaneous.*

Some of the Activities of Bureau of Mines in 1942

Dr. R. R. Sayers, Director of the Bureau of Mines, has informed Secretary Ickes that since December 7, 1941, the Bureau of Mines has perfected metallurgical processes which are now being used to tap reserves of low-grade ores, has more than doubled the output of helium, charted millions of tons of critical, essential, and strategic ores, and launched programs to make secure the uninterrupted output of mines, smelters, quarries, and coke ovens and other facilities of the mineral industries.



ON THE JOB FOR OVER 65 Years

The above prize winning photo is by I. F. Patt of Providence Gas Co.

Back in the days when the telephone was still a curiosity, Connelly Iron Sponge was supplying the purifying needs of the leading gas companies of the East. And, like the telephone, its use has grown with the years until today it is depended upon throughout the country wherever the utmost in purification efficiency is demanded.

Its extra high capacity and remarkable revivifying properties insure exceptionally long life and its cost per 1000 feet of gas is unusually low. In the face of today's unprecedented demands, these qualities are more important than ever, and records prove that Connelly Iron Sponge is maintaining purification standards despite increased daily loads.

You'll find it profitable to get the facts about Connelly Iron Sponge. Connelly engineers will gladly consult with you without obligation.

Connelly IRON SPONGE & GOVERNOR COMPANY
CHICAGO, ILL. • ELIZABETH, N. J.

News of the Gas Industry

Lone Star Gas Reorganization Approved by SEC

The Securities Exchange Commission on Dec. 1st, entered an order formally approving a reorganization plan submitted by the Lone Star Gas Corporation and its subsidiaries under the holding company act and permitting such declarations to become effective forthwith.

Subsidiary companies involved in the reorganization are Dallas Gas Company, Lone Star Gas Company, Community Natural Gas Company, Texas Cities Gas Company, Council Bluffs Gas Company and Lone Star Gasoline Company.

The reorganization plan contemplates sale by the Lone Star Gas Corporation of its interest in the Council Bluffs Gas Company, distribution of the Northern Natural Gas Company common stock owned by Lone Star to stockholders of this company as a dividend, and the combining of the rest of the companies in the Lone Star system into two new operating companies to be created under the laws of Texas.

Southwestern Gas Financing Plan Is Given Approval

The Securities and Exchange Commission on Nov. 23d, approved a proposal submitted by the Texas Southwestern Gas Company for the issuance and sale of that company's twenty-year sinking fund first mortgage 3¼ per cent bonds and twenty-five-year 6 per cent sinking fund debentures in connection with the previously approved plans for reorganization of the Southern Union Gas Company, and the New Mexico Gas Company, New Mexico Eastern Gas Company.

The issue and sale of the securities approved are necessary in the financing of the intersystem sales and acquisitions of certain properties and securities, the liquidation of certain subsidiary companies and the refinancing of the principal surviving operating company.

Other companies involved in the reorganization include the Arkansas Western Gas Company, Quanah Water Company, Southern Union Production Company, Angels Peak Oil Company, Congress Oil Company and Summit Oil Company.

Schoellkopf Board Chairman Niagara Hudson Power Corp.

Paul A. Schoellkopf, vice chairman of the board of directors of Niagara Hudson Power Corporation, was elected chairman of the board of directors of that corporation at its meeting held in New York, December 10th. He succeeds the late Floyd L. Carlisle.

Mr. Schoellkopf has been active in the affairs and operations of the Niagara Hudson System and its predecessor companies for the past thirty-five years. He has been a member of the board of directors of Niagara Hudson Power Corporation since 1929 and was its president from 1929 to 1933. He was then elected vice chairman of the board of directors, which position he has since occupied. Mr. Schoellkopf is also chairman of the board of directors of Buffalo, Niagara and Eastern Power Corporation and president of The Niagara Falls Power Company.

In 1907 Mr. Schoellkopf became associated with his father as assistant to the secretary and treasurer of the Niagara Falls Hydraulic Power and Manufacturing Company, one of the predecessor companies of The Niagara Falls Power Company. In 1913 he became its general manager.

Paul A. Schoellkopf

During World War I the several generating and distributing power companies at Niagara Falls were consolidated into the present The Niagara Falls Power Company, and in 1920 Mr. Schoellkopf became its president and has continued in active charge since that time.

In 1925 The Niagara Falls Power Company joined with other major operating utilities in western New York to form Buffalo, Niagara and Eastern Power Corporation, with Mr. Schoellkopf as its president. He served in that capacity until 1929, when he was elected chairman of the board of directors.

On June 18, 1929, Niagara Hudson Power Corporation was formed by the consolidation of several major utility groups serving a large portion of upper New York State, and Mr. Schoellkopf was made president.

Officers and Directors of the Oklahoma Utilities Association For 1943

President: J. C. Happenny, President, Oklahoma Power & Water Co., Sand Springs, Oklahoma.

First Vice President: E. C. Joullian, President, Consolidated Gas Utilities Corp., Oklahoma City, Oklahoma.

Second Vice President: George McLean, Oklahoma Gas and Electric Company, Oklahoma City, Oklahoma.

Treasurer: D. S. Kennedy, Treasurer, Oklahoma Gas and Electric Company, Oklahoma City, Oklahoma.

Secretary: Kate A. Niblack, Oklahoma City.

John W. West, Jr., Receives A.G.A. Appointment

John W. West, Jr., Secretary of the Residential Section of the American Gas Association, has been appointed assistant managing director of the Association, it has been announced by Alexander Forward, managing director.

Mr. West joined the Association in 1925. He was first engaged in safety activities, which are still under his direction, and subsequently was promoted to the positions of field representative and Secretary of the Commercial Section, since known as the Residential Section.

Mr. West is a graduate of the Virginia Polytechnic Institute, Blacksburg, Virginia, where he also took post graduate work and served as an instructor for two years. He performed inspection work for the State Corporation of Virginia, followed by sales of equipment to utilities in Virginia and North Carolina.

Subsequently he was in charge of purchase and measurement of natural and casing head gas in Oklahoma and Texas fields for the Tidal Oil and Gas Company in Tulsa, Oklahoma. In 1920, he returned to Virginia to become chief engineer of the Commission in charge of public utilities. There he was engaged in appraisal, valuation, rate making and servicing activities in connection with telephone, water, street railway, gas and electric utilities. He joined the American Gas Association February 1, 1925.

A. R. Bailey of Coast Counties Co. Enters Supply Branch of Army

Allan R. Bailey, Assistant to the President, of Coast Counties Gas and Electric Company, has been commissioned Major in the Services of Supply branch of the Army. Major Bailey was head of the A. G. A. Approval Requirements Committee.

Cincinnati Will Be Host to 49th Meeting of ASHVE

The 49th Annual Meeting of the American Society of Heating and Ventilating Engineers will provide a forum for the exchange of vital engineering information, according to the statement of Pres. E. O. Eastwood, Seattle, who announced the time and place of the meeting—January 25-27, 1943, Hotel Gibson, Cincinnati, Ohio.

The Meetings Committee has prepared a streamlined program which includes subjects of wartime interest, such as fuel conservation, food dehydration, manpower problems, warship ventilation and physiological studies affecting efficiency and health. A special panel discussion of the subject, "How to Keep Fit in Cold Homes" will be a feature of one session.

Four technical sessions will be held, commencing on Monday morning, January 25, and there will be several research papers covering studies of heating plant operation with reduced night temperatures, resistance of various building materials to vapor transmission, and performance of air duct outlets.

The members of the Cincinnati Chapter will be hosts for the occasion and the Committee on Arrangements has announced three outstanding social functions: First, a joint meeting with members of the Cincinnati Engineers' Club at noon on Monday; a get-together dinner and ice show on Monday evening, and the Annual Banquet on Tuesday evening.

"Make Every Minute Count" Is Slogan of Servel War Workers

War workers at Servel, Inc., Evansville, Indiana, observed the first anniversary of Pearl Harbor on December 7, 1942 by pledging themselves to "MAKE EVERY MINUTE COUNT" in the production of war supplies needed to help the United States win a speedy victory in the war.

Details of the new campaign—dedicated to more than 500 Servel employees in the armed forces—were worked out by a six-man committee representing both workers and management. These plans were formulated after a careful study of the best war production programs now in operation in other leading industries.

First step in the campaign was to secure pledges from all workers—both men and women—stating that they would do everything possible to speed the battle of production. Each pledge, attractively printed in red and blue, carries the following obligation:

"I recognize that as an employee of Servel, Inc., engaged in the production of war materials, I have a responsibility to my country, my fellow workers and to the men in the armed services. Therefore, I solemnly pledge that, as a soldier of production I will put forth my very best efforts to *'Make Every Minute Count'* in the production of things that are needed to help U. S. win a speedy and glorious victory."

Workers who signed these pledges received buttons bearing the slogan, *"Make Every Minute Count"* which they will wear every day while at work.

As soon as all employees of any one department have pledged their personal support to the company's production of essential war weapons and materials of workers in that department, will be given handsome double-wing pins for street or dress wear.

Louis Ruthenburg, president of Servel, Inc., is general chairman of the campaign. In the principal talk at the kick-off meeting on December 7, he declared that "What America needs—and what every Servelian needs—to win this war is to get fighting mad.

"In launching this campaign our one and only objective is to help win the war as quickly as possible," he said. "But we have just begun. There is still a long, long road ahead to victory."

Mr. Ruthenburg also declared that Servel has one of the greatest assets of any war industry in the nation.

"This asset," he said, "lies in the feeling that Servel is a great institution and one that has the tremendous possibilities in the post-war period. Not only has Servel successfully converted to war but it will again convert to peace. When the time is ready for this conversion Servel will be among the first to undertake the task of providing commodities that will be urgently needed in the reconstruction era."

Servel's current war production includes airplane wings, breech casings, fire units for field ranges, airplane engine castings, aircraft parts and many forms of miscellaneous war work services.

In addition to all this Servel is building gas and kerosene refrigerators, as well as commercial refrigerating equipment, sent to army camps both here and abroad. Hundreds of Servel refrigerators are now in operation in army bases in Africa, islands in the Pacific area, and in South America. These refrigerators are used mainly for the storage of serums and other medical supplies which must be kept at constant temperatures.

Ruthenberg Re-elected Pres. Indiana Chamber of Commerce

Louis Ruthenberg, president of Servel, Inc., Evansville, Ind., was re-elected president of the Indiana Chamber of Commerce at the recent annual meeting of that organization in Indianapolis, Ind.

Coast Counties Co. Elects Edmund Vice-President

Harvey Edmund has been elected Vice-President and General Manager of Coast Counties Gas and Electric Company, Santa Cruz, California.

Rehabilitation of Gas Properties

Arthur J. Smith, gas engineer, who has specialized in rehabilitating gas properties, is now located at 5130 Dorchester, Chicago.

Speakers at the "kick-off" dinner for the Servel drive for increased war production are shown above. Left to right are Lieutenant Rausch, of the army air forces; N. I. Townsend, secretary and treasurer of Servel, Inc.; Lieut. Comdr. F. G. Healy of the U. S. Navy; Louis Ruthenburg, president of Servel; W. E. Baker, vice-president of Servel in charge of production, who was toastmaster; August Horstman, president of the Servel Employees' Association, and Maj. F. A. Dixon, army air forces resident representative. The dinner was held December 12th at the Hotel McCurdy.

THE STACEY MANUFACTURING CO.
Engineers Fabricators Constructors
• Gas Holders • Gas Plant Equipment • Steel Plate Construction •
GAS HOLDER INSPECTION SERVICE
Cincinnati — Ohio
91
STACEY SINCE 1851
Years

J. J. Winn, Jr., Portland, Oregon, With Corps of Engineers

A commission of major in the Corps of Engineers, Army of the United States, has been received by John J. Winn, Jr., commercial manager of Portland (Ore.) Gas & Coke Company. Trained in engineering at Massachusetts Institute of Technology and Johns Hopkins University, Winn began his career in utility sales and engineering with Stone & Webster.

Before joining Portland Gas & Coke Company six years ago he had been with

J. J. Winn, Jr.

the Consolidated Gas, Electric, Light & Power Company of Baltimore and the Hartford Gas Company. He had been chairman of the industrial section of the New England Gas Association and was a member of the industrial equipment and refrigeration committees of the A.G.A. He was also a member of the board of directors and chairman of the sales committee of the Pacific Coast Gas Association.

Major Winn was active in community and business groups and was a member of the Oregon State Board of Education. He was vice president of both the East Side Commercial and Sales Managers clubs, a member of the National Sales Executive association and chairman of the Portland Rotary Club's nationally known "Dutch Uncle" program.

He was a veteran of World War 1.

R. W. Allen Joins Staff of Wheelco Inst. Co.

Roger W. Allen, district sales engineer for Foxboro Co. at Atlanta, Ga., for the past six years, has been named southeastern district manager for Wheelco Instruments Co., Chicago. He will make his headquarters at 305 Techwood Dr., Atlanta.

A native of Atlanta, Allen attended Massachusetts Institute of Technology and holds an electrical engineering degree from Georgia Technological Institute. He is licensed as a professional engineer by the state of Georgia.

Semet-Solvay Wins "E" Award

"For high achievement in the production of war material" the Army-Navy "E" has been awarded to the Syracuse plant of the Semet-Solvay Company, a subsidiary of Allied Chemical and Dye Corporation. The letter of Robert P. Patterson, Under Secretary of War, announcing the award extended congratulations to the employees of Semet-Solvay Company "for accomplishing more than seemed reasonable or possible a year ago." This is the second Allied Chemical subsidiary to win the coveted "E" award recently, the Solvay Process Company's Hopewell, Va., plant having won theirs previously.

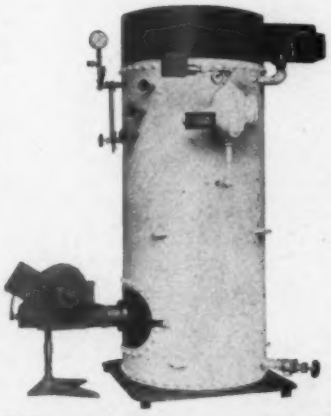
The Semet-Solvay plant at Syracuse makes chemical products vital to the war effort. The presentation of the "E" burgee was made during an impressive ceremony by Col. A. J. Schamehorn, U. S. A., Deputy District Chief, Rochester Ordnance District, while "E" lapel pins were presented to employes by Lt. John T. Casey, U. S. N. R.

Pay Roll Calculator

Pay rolls and job costs can be figured in a fraction of the usual time through the use of a new calculator, according to the manufacturers, the Berger-Bricker Company, of 433 South Spring Street, Los Angeles, California.

Operating on a simple new principle, this device includes all hourly rates of pay from $0.50 to $1.75 with a half-cent spread between rates. It covers all time periods up to 104 hours with divisions of one-tenth of an hour. Made of lacquered wood and fits into a desk drawer. Selling price is $7.50.

LATTNER
GAS — OIL BOILER
3 HP to 35 HP.



Burns natural gas or regular furnace oils with equal efficiency.

P. M. Lattner Mfg. Company
Cedar Rapids, Iowa

Wethly Joins Wilputte Organization

Franz Wethly, whose career as a designer and builder of by-product coke ovens has taken him around the world, has joined the Wilputte Coke Oven Corporation, it was announced recently by L. N. Wilputte, president. Mr. Wethly, until recently vice president of the Otto Construction Company, came to this country in 1939 from The Hague, Netherlands, where he directed the Dutch operations of the Otto interests. Wilputte Coke Oven Corporation is a subsidiary of Semet-Solvay Company, which is a subsidiary of Allied Chemical & Dye Corporation.

Miss Gladys Price Now in WAVES

Miss Gladys Price, home service director of the Southern Counties Gas Company (Los Angeles) has been commissioned a lieutenant junior grade in the Women's Naval Reserve. The commission was presented by Lieutenant Frances E. Shoup at the Los Angeles Naval Armory.

Gladys P. Price

Already at Smith College, Northampton, Mass., Miss Price will receive a month's instruction and conditioning after which she will be on duty somewhere in the continental United States.

She has been home service director of the Southern Counties Gas Company since 1933.

Miss Mercedes Bates, formerly home service representative in Hollywood has been appointed acting home service supervisor to succeed Miss Price for the duration.

Industrial and Commercial Gas Conference

The A. G. A. Industrial and Commercial Gas Conference has been scheduled for March 11th to 12th at the Hotel Statler in Detroit. Information outlining the program will be available later.

Obituary

MABON P. ROPER

Mabon P. Roper, 50, president of George D. Roper Corporation, Rockford, Ill., and a national figure in the gas stove and appliance industry, died December 10th.

The son of Mr. and Mrs. George D. Roper, he was born in Rockford, April 19, 1892, and had lived there all his life.

He was educated in local schools and was graduated in June, 1914, from Cornell University with a degree in mechanical engineering.

Mabon P. Roper

After his graduation from Cornell, Mr. Roper entered the employ of the firm, then known as the Eclipse Gas Stove Company. He started at the bottom and rose progressively from errand boy to file clerk, member of the billing department, credit manager and secretary.

In this manner he gained first hand knowledge of the firm's extensive operations that stood him in good stead when he took over its direction upon the death of his father, Nov. 17, 1925.

Mabon Roper's history was closely tied in with that of the Roper company, many old timers recalling how as a boy of 10 or 12 he accompanied his father on many business trips during which the elder Mr. Roper laid the groundwork for general acceptance of the gas stove as a cooking medium.

From the time he entered the employ of the company in 1914, he had a hand in shaping its destiny. A willing lieutenant, he equipped himself well in knowledge of company problems, and assumed complete responsibility of management when his father died in 1925.

At the time of his death, he was president and a director of George D. Roper Corporation, and a director of Blackhawk Engineering Company, Roper subsidiary.

D. C. JOHNSON

David C. Johnson, vice-president of Consolidated Edison Company of New York, and president of New York Steam Corporation, died December 19th at his home, 420 Park Avenue (Manhattan) of a heart attack. He was 57 years old.

Mr. Johnson was born in Brooklyn on August 24, 1885. He attended Polytechnic Preparatory School and Stevens Institute of Technology, from which he was graduated in 1906 with the degree of mechanical engineer. On leaving college he was employed for a short time by the Astoria Light, Heat and Power Company, one of the predecessors of Consolidated Edison Company, working on the construction of a new gas works. He then became assistant engineer to H. deB. Parsons, consulting engineer. He was employed by Humphreys and Miller, consulting engineers, in connection with the appraisal of public utility properties, and for a year by Kean, Taylor and Company, members of the New York Stock Exchange, as statistician.

Soon after The National City Company was organized, Mr. Johnson became associated with that company and in 1918 was appointed manager of its public utilities department. There he investigated and negotiated the financing of many large public utility companies in this and other countries. In 1922 he was elected a director of New York Steam Corporation; in 1927 a vice-president, and in 1928 president of that company. In 1937 he was elected a vice-president of Consolidated Edison Company, and in March of the following year, a trustee. Mr. Johnson was also a director of the Long Island Railroad Company and a trustee of Stevens Institute of Technology, and a member of its Finance Committee. He was the author of "Yields of Bonds and Stocks," a widely used financial reference book.

FRANK D. CADWALLADER

Frank D. Cadwallader, vice president in charge of public relations for the Boston Consolidated Gas Company, died November 29 after an illness of three days.

Mr. Cadwallader was widely known throughout the utility industry, here and in other parts of the country, and was an important figure in the national advertising program of the American Gas Association.

He was born in Trenton, New Jersey, July 4, 1882. His first contacts with the utility business were in Lowell and Toronto. In 1912 he became New England representative of the Standard Gas Equipment Corporation of New York. In 1927 he came to the Boston Consolidated Gas Company as vice president in charge of sales and continued in that capacity until January 1, 1937, when he became vice president in charge of public relations for the company.

FREDERICK M. BECKET

Frederick M. Becket, a consultant to the Union Carbide & Carbon Corporation, had been associated with the corporation and its subsidiaries since 1906, died December 1st at the age of 67.

Mr. Becket was formerly president of Union Carbide & Carbon Research Laboratories, Inc., and former vice-president of Union Carbide Company, Electro Metallurgical Company and Haynes Stellite Company, all units of the Union Carbide & Carbon Corporation.

He had received numerous awards, including the Modern Pioneer Award of the National Association of Manufacturers in 1940.

Standard Specifications for Gas Floor Furnaces

Standard minimum specifications for gas floor furnaces of the gravity circulating type have been approved by the American Standards Association, 29 West 39th Street, New York (Commercial Standard CS99-42). With the latest American Standard Approval Requirements for Central Heating Gas Appliances (ASA.: Z21.13-1940) as basic prerequisites, this standard covers construction and installation requirements for gravity circulating type gas floor furnaces, including those having single or dual wall register outlets, for use with natural, manufactured, mixed and liquefied petroleum gases.

This new standard, which was developed by the National Bureau of Standards, includes the sizing, placement, general installation requirements, venting, gas connections and methods of certifying compliance with the standard.

Gas Engines. Vertical, four-cycle, totally enclosed "CCG" gas engines are described and illustrated in considerable detail in Bulletin S-550-B21 issued by Worthington Pump and Machinery Corporation, Harrison, N. J. Construction details are featured. For normal stationary service they are built in six sizes ranging from 200 to 535 H.P. Copy of bulletin on request.

The Reliable Shut-Off for Street Mains

THE GOODMAN STOPPER

Now has the "Z" handle for easy manipulation. When locked in place it holds. Stopper cannot slip. Gas cannot pass. Adjusted in 30 seconds.

Ask for circulars on this and other distribution equipment.

Nearly a half century of service to the Gas Industry.

Safety Gas Main Stopper Co.
523 Atlantic Avenue, Brooklyn, New York

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IRON OXIDE for gas purification

The largest iron oxide plant in the world, stocking 600,000 bushels of ready-to-use sponge at all times.

Gas Purifying Materials Co. Inc.

GPM

IRON HYDROXIDE

Long Island City, New York

Gas Industry in 1942

(Continued from page 14)

heating and 36% for space heating.

Appointment by the Association of a Committee on Post-War Planning recognizes the vital necessity for preparing how to meet the stepped-up competition immediately following the cessation of hostilities and to prepare for the inevitable dislocation of industry. A survey of gas company opinion shows that a majority of companies feel that if they render efficient and satisfactory service now their customers will become boosters of gas fuel in the post-war period.

A survey conducted during the year brought out the fact that gas companies were in favor of having the American Gas Association coordinate and supervise the research work of the gas industry. Among the branches of the industry specifically named to conduct research projects were the American Gas Association Testing Laboratories, the Institute of Gas Technology, the utilities and the gas appliance manufacturers.

Gas Heating Survey

(Continued from page 21)

lined in the "Procedure" section of the "Heating Survey and Calculation" form is followed, it has been found that the work of arriving at a proper furnace size is simpler than if the estimator jumps from one part of the procedure to another. In this manner, all measurements can be made at the same time and all charts can be read at the same time, thus leaving simple addition to be performed in order to arrive at the correct furnace size.

The majority of homes in Southern California fall within the 2H type—stucco, paper, studs, lath and plaster — for which a coefficient of 0.398 and an input factor of 26 have been found the most practical.

The method of simplified calculation, F. O. Suffron, managing director of the Institute of Gas Heating Industries, declared at Los Angeles, was designed to meet the worst possible conditions in that area.

"We determined upon the worst condition that would be satisfactory," Mr. Suffron said, "and then decided upon a differential of 40% between average outside and average inside as being suitable. The chief purpose of the calculating method we have devised is to improve installation of gas heating furnaces and to assure adequate heating. The system comes within 5% efficiency."

The plan falls within the provisions of the Los Angeles Municipal Code and has been pronounced acceptable by the city authorities.

While the method of heat calculation outlined in this article was designed for weather conditions in Southern California and is applicable, in the form presented here, only to that area, the basic method can be made adaptable to any section of the country by designing charts, tables, coefficients and input factors to correspond with construction types and temperature differentials suitable to respective sections of the United States.

All-Out War Effort

(Continued from page 26)

tricts to introduce the program. From then on it will be carried on through smaller educational meetings in the sub towns. We had already planned a nutrition course for our employees when Servel came along with an organized program that we were able to adapt easily to our situation.

Yes, we find ourselves doing some unthought-of things in the war effort, but we believe that it is a practical investment of time and money to the communities, to the cause of Victory and to ourselves.

Validity of Contract

(Continued from page 30)

removed. In other words, the device is personal property and may be removed from the building notwithstanding objections of the property owner.

Therefore, under all circumstances, when determining whether a device or equipment is a trade fixture, and, whereby it is a permanent portion of the building or premises, the important consideration is: Was it intended to be a permanent fixture, and is it attached to the building or premises in such a manner that it cannot be removed without permanent damage to the building or premises? If so, it is a trade fixture and cannot be removed by the gas corporation, unless consent of the property owner is obtained.

In Alwes v. Richheimer, 47 S. W. (2d) 1084, it was shown that a corporation attached to a building certain articles such as seats, electric fans and the like. In holding this corporation not entitled to remove the articles, the court said:

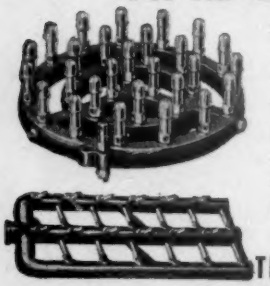
"We think the articles emunerated above are fixtures because, not only are they attached to the building, but are used and are useful in connection with the building."

On the other hand, in National Company v. Mishler Company, 167 Atl. 324, it was shown that a corporation installed 668 opera chairs in the auditorium of a building to replace approximately 700 old chairs.

In this case the corporation did not originally intend to permanently attach the chairs to the leased building. Therefore, since the chairs were attached by screws *readily removable* the higher court held the chairs to be personal property and removable, notwithstanding the fact that the landlord objected to their removal.

BARBER BURNERS

For All Gas Appliances



Our facilities are now mainly employed on war work. For those limited purposes for which our regular line of products is permitted, we shall continue to supply them. Later, when normal conditions are restored, Barber will furnish its customary service to the trade on high quality Burners and Regulators.

Latest Catalog on request.

THE BARBER GAS BURNER CO.

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"CLEVELANDS"

TOPS for

Cross Country Transmission Lines—Distribution Lines—Short Service Extensions—Stripping Pipe for Reconditioning and Relaying—Ordinary Maintenance.

THE CLEVELAND TRENCHER COMPANY

"Pioneer of the Small Trencher"

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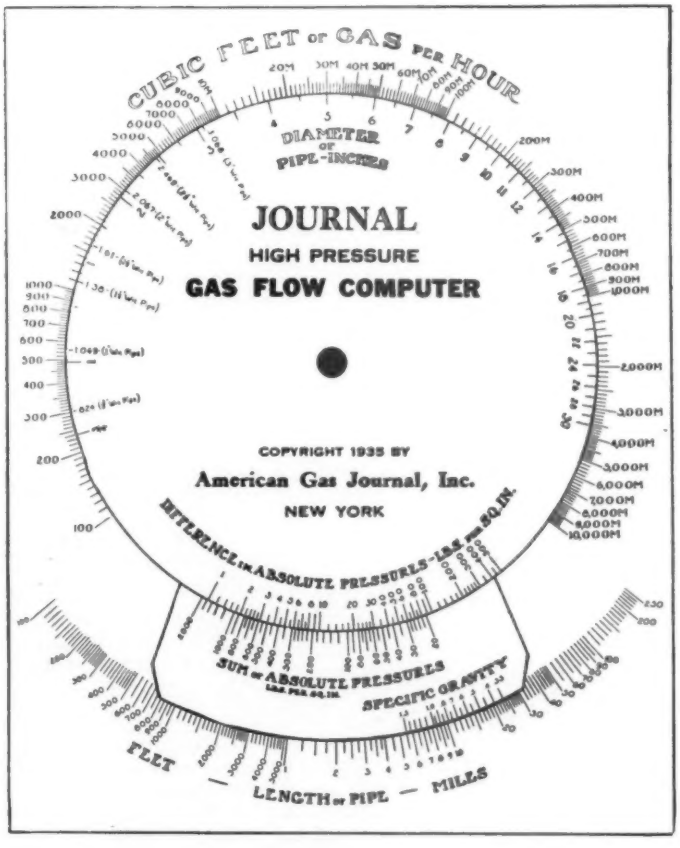
"Journal" Gas Flow Computers



New Improved Gas Flow Computers now available of durable celluloid, encased in a convenient leatherette cover with complete instructions.

Actual Size 6¼ x 7½

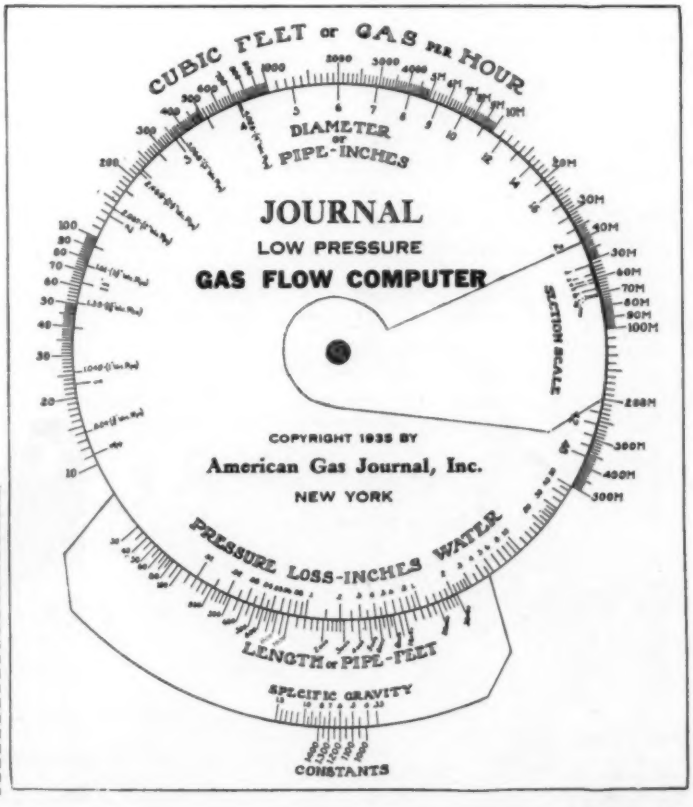
High Pressure Computer Range:

Cu. Ft. of Gas Per Hour—100-10,000 M
Diameter of Pipe Inches ¾-30
Difference in Absolute Pressure—Lbs. per sq. in. 1-500
Sum of Absolute Pressures—Lbs. per sq. in 2000-20
Specific Gravity 1.5-.35
Length of Pipe—Feet 100-5000
Length of Pipe—Miles 1-250

Low Pressure Computer Range:

Cu. Ft. of Gas Per Hour—10 to 500 M
Pipe Diameter ¾" to 48" (including standard and actual weight up to 4")
Pressure Loss Inches .01-10.
Length of Pipe—Feet 30-30,000
Specific Gravity 1.5-.35
Constants 1400-1000

Price $3.50 Each, Postage Prepaid



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Please enter our order for Computers as follows at $3.50 each, postage prepaid

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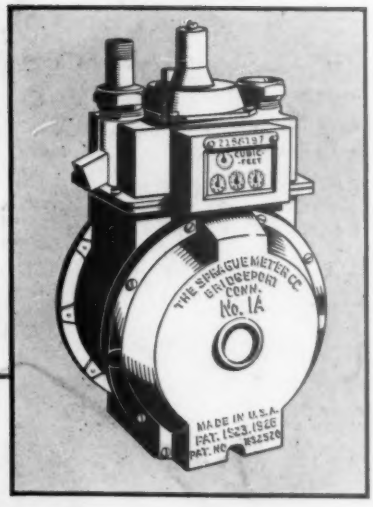

Your Government is counting on you to make your equipment last by adequate repairs for the duration. This calls for a maintenance program unprecedented. Let our representatives show you how to keep your meters measuring. Let our representatives acquaint you with a modernizing program that will give you so much for so little. Your oldest Sprague Meters can be modernized with a minimum of effort and expense to equal those fresh from today's assembly line — meters capable of meeting load conditions for some time to come. Safeguard your meter investment and conserve gas through accurate measurement by adopting an intelligent maintenance program for the duration. Conserve for Victory.

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